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Tobacco Prevention and Cessation Policies and Youth Tobacco Use in Florida Public Schools

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TOBACCO PREVENTION AND CESSATION POLICIES AND YOUTH TOBACCO USE IN FLORIDA PUBLIC SCHOOLS

by
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ABSTRACT

Tobacco use is the leading cause of preventable disease and premature death in the United States. In 2014, an estimated 16.8% of adults were current cigarette smokers, and 9.2% of high school students smoked cigarettes. Nearly 90% of smokers developed their habit as teenagers, and students' tobacco use in high school influences their behaviors later in adulthood. Smoking behaviors appear to be inseparable from the social environment, physical environment, small social groups, and cognitive and affective processes. Preventive strategies, such as advertising bans, clean indoor air laws, education programs, increased taxes, labeling limitations, mass-media campaigns, and youth access regulations, have been commonly used to prevent and reduce youth tobacco use nationwide. In Florida, local public school districts were authorized to develop new tobacco-free school policies through an amendment to the Florida Clean Indoor Air Act in June 2011. The purpose of this study was to determine the impact of the recently implemented smoking cessation policies, as well as individual-level factors and interpersonal-level factors, on youth tobacco use in Florida public schools.

This study employed a pooled cross-sectional design with data for high school students from the Florida Youth Tobacco Survey (FYTS) in 2010 (n=37,797) and 2014 (n=32,930). It was guided by a theoretical framework based on the reasoned action approach and the social ecological model. Hierarchical logistic regression was used to analyze the data. The four models were binary logistic regression for cigarette use, multinomial logistic regression for cigarette use, binary logistic regression for cigar use, and multinomial logistic regression for cigar use. The results of this study support the importance of the individual-level constructs of background factors, behavioral beliefs, and control beliefs, the interpersonal-level construct of normative beliefs, and the policy-level construct of actual behavioral control when applied to youth tobacco

use. These findings led to a better understanding of which policies, environments, and cognitions contribute to preventing and reducing teenage tobacco use, which is imperative in controlling the risks related to smoking and improving youth health. Now that the individual-level factors, interpersonal-level factors, and policy-level factors that contribute to youth tobacco use were recognized, preventative and therapeutic programs and interventions can be suggested and improved. This study provided evidence-based knowledge for improving public policies and interventional strategies towards smoking prevention and cessation for youth.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1. INTRODUCTION

Tobacco Use and Youth Tobacco Use in the United States

In the United States, the widespread use of tobacco began over a century ago, and the epidemic of tobacco-caused diseases and premature mortality associated with tobacco use remains prevalent today (U.S. Department of Health and Human Services [U.S. DHHS], 2014). An estimated 40.0 million U.S. adults, or approximately 16.8%, were current cigarette smokers in 2014 (Jamal et al., 2015). Tobacco use is the leading cause of preventable disease and premature death in the United States (Centers for Disease Control and Prevention [CDC], 2012). It kills over 480,000 individuals in the United States each year, and more than 42,000 of these deaths are a result of exposure to secondhand smoke (SHS) (Jamal et al., 2015; U.S. DHHS, 2014). From 2009 to 2012, the annual economic costs attributable to smoking were estimated to be greater than $289 billion. At least $133 billion went to direct medical care costs of adults across the country, and there was more than $151 billion in lost productivity as a result of premature death estimated from 2005 to 2009 (U.S. DHHS, 2014).

Each day, more than 3,800 individuals under the age of 18 smoke their first cigarette in the United States, while more than 1,000 youth become daily cigarette smokers (CDC, 2012). In Florida, more than 22,800 children under the age of 18 become new cigarette smokers each year (Tobacco Free Florida, 2011). Factors associated with youth tobacco use include an individual's cognitive and affective processes, small social groups, and social and physical environments (CDC, 2012). Behaviors related to tobacco use are often established during adolescence. For example, 90% of smokers begin the habit by age 18 (CDC, 2014c). This fact signifies the influence of students' behaviors in high school on their tobacco use later in adulthood (CDC, 2012). Since tobacco eventually kills up to half of its users (World Health Organization [WHO],

2014a), understanding the contributing factors to the initiation and establishment of tobacco use is imperative.

Therefore, the development and implementation of preventive strategies to prevent and reduce youth tobacco use is necessary to ultimately decrease the prevalence of adult tobacco use in the country and subsequently reduce the associated diseases and premature mortality (CDC, 2012). Examples of the many possible approaches are advertising bans (CDC, 2012; Lantz et al., 2000; U.S. DHHS, 1994; WHO, 2013), clean indoor air laws (CDC, 2012; U.S. DHHS, 1994), education programs (CDC, 2012; Lantz et al., 2000; U.S. DHHS, 1994), increased taxes (CDC, 2012; Lantz et al., 2000; Marr & Huang, 2014; U.S. DHHS, 1994), labeling limitations (CDC, 2012; U.S. DHHS, 1994), mass-media campaigns (CDC, 2012; Farrelly, Niederdeppe, & Yarsevich, 2003; Lantz et al., 2000; U.S. DHHS, 1994), and youth access regulations (CDC, 2012; Lantz et al., 2000; U.S. DHHS, 1994). These preventive strategies "help counter the influences that encourage young people to begin tobacco use" (CDC, 2012, p. iii). Programs and policies aimed at youth have been established at the national, state, and local levels in the United States. One example of an important and effective strategy is a tobacco-free school policy. These policies have been developed and implemented by school districts in many states. They vary because school districts may selectively adopt them. Not only does a comprehensive tobacco-free school policy prevent individual tobacco use, but it also benefits everyone through the reduction of exposure to SHS and the creation of "frameworks and systems that reinforce tobacco-free norms and attitudes" (Torlakson, n.d., p. 2). This type of policy has the ability to reach student populations, school employees, and school visitors (Barbero, Moreland-Russell, Bach, & Cyr, 2013; Eaton, Marx, & Bowie, 2007).

In 1985, the Florida Legislature enacted the Florida Clean Indoor Air Act to protect citizens from the health hazards of SHS by permitting designated smoking areas. In 2002, 71% of citizens in Florida voted for an amendment to ban smoking in all enclosed indoor workplaces. This smoke-free law became effective on July 1, 2003 (Tobacco Free Florida, 2014a). In June 2011, "Florida Governor Rick Scott signed a law to amend the Florida Clean Indoor Air Act to give public school districts the authority to implement policies designating all district property as tobacco-free if they choose to do so" (Terry & Zhang, 2016, p. 130). Prior to this amendment, "a school district was precluded from regulating smoking on school property other than prescribed in the Florida Clean Indoor Air Act" (Terry & Zhang, 2016, p. 130). Now, each public school district in the state of Florida has developed and implemented its own tobacco-free school policy that applies to all of its public schools. There are 12 possible components, which are generally based on the CDC's "Guidelines for School Health Programs to Prevent Tobacco Use and Addiction" (CDC, 1994). While these policies vary in their content and comprehensiveness as a result of the different rates of adoption by each public school district, they share the objective of reducing youth tobacco use. The variations in the tobacco-free school policies that have been implemented in Florida public school districts since 2011 provide an opportunity to study the impact of comprehensive policies and assess whether they reduce youth tobacco use among Florida high school students.

Theoretical Framework

A behavioral theory and a system theory can further the understanding of youth tobacco use behaviors and their influencing factors. The two theories guiding this study were the reasoned action approach and the social ecological model. Developed to explain and predict human behavior, the reasoned action approach considers three types of beliefs – behavioral

beliefs, normative beliefs, and control beliefs. Behavioral beliefs relate to the positive or negative consequences of a certain behavior (Fishbein & Ajzen, 2010). A student might associate positive or negative consequences with tobacco use. Normative beliefs are the beliefs about whether the important individuals in an individual's life would approve or disapprove of the behavior, which are also known as injunctive normative beliefs, as well as the beliefs that these people perform or do not perform the behavior themselves, which are also known as descriptive normative beliefs (Fishbein & Ajzen, 2010). These important individuals include family members and peers at school. An injunctive norm in the context of this study is whether these people approve or disapprove of tobacco use, and a descriptive norm is whether they use tobacco themselves. Control beliefs relate to personal and environmental factors that can support or hinder the behavior, which result in a perceived behavioral control (Fishbein & Ajzen, 2010). Actual behavioral control is comprised of "relevant skills and abilities," as well as existing "barriers to and facilitators of behavioral performance" in the environment (Fishbein & Ajzen, 2010, p. 21). Both the control beliefs and actual behavioral control in this study are related to the tobacco-free school policies in Florida public school districts.

The social ecological model emphasizes the importance of understanding social and regulatory environments in the prediction of individual health behavior. As a model of health that highlights the linkages and relationships among multiple factors affecting health (Institute of Medicine, 2003), the social ecological model includes the following five levels of influence: individual, interpersonal, organizational, community, and policy. These levels contain factors that influence youth tobacco use.

Aims of the Study

Now that each public school district in Florida has developed and implemented its own tobacco-free school policy, this study aimed to determine whether outcomes related to youth tobacco use across districts in Florida are improving and to address the five following research questions:

1. What is the impact of background factors on youth tobacco use among Florida high school students?
2. Do tobacco-free school policies reduce youth tobacco use among Florida high school students?
3. What is the impact of behavioral beliefs on youth tobacco use among Florida high school students?
4. What is the impact of normative beliefs on youth tobacco use among Florida high school students?
5. What is the impact of control beliefs on youth tobacco use among Florida high school students?

Significance of the Study

Continued efforts to prevent and reduce teenage smoking are critical in order to combat youth tobacco use. For each percentage-point reduction in the smoking rate, an estimated 169,000 current high school students will not begin to smoke, and 59,100 will not die from a tobacco-related cause (Campaign for Tobacco-Free Kids, 2016). Research documented in the 2012 Surgeon General's report suggested that "comprehensive school-based programs, combined with community and mass-media efforts, can effectively prevent or postpone smoking onset in

20% to 40% of adolescents" in the United States (CDC, 2012; North Dakota Department of Health, 2010, p. 5).

A better understanding of the efforts to prevent and reduce teenage tobacco use is imperative in successfully eliminating the tobacco use problem in the state of Florida. Now that the individual-level factors, interpersonal-level factors, and policy-level factors that contribute to youth tobacco use were recognized, the preventative and therapeutic programs and interventions can be suggested and improved.

Analytic Approach

This study employed a pooled cross-sectional research design. Pooled cross-sectional data represent the results of a repeated survey. The available datasets were the Florida Youth Tobacco Survey (FYTS) results from 2010 and 2014, which were provided by the Florida Department of Health (FDOH) after a data sharing agreement was signed and submitted by the researcher. The 2010 FYTS and 2014 FYTS were administered to and completed by a sample of high school students in grades 9 through 12 in the state of Florida. Using a two-stage cluster probability sampling methodology, a random sample of public high schools was selected, and then, a random sample of classrooms was chosen within each selected school. All of the students in these classrooms were invited to participate in the FYTS.

The IBM SPSS Statistics Premium GradPack 23 computer software was used to determine the individual-level factors, interpersonal-level factors, and policy-level factors that are associated with youth tobacco use through hierarchical binary logistic regression and hierarchical multinomial logistic regression. In this study, the outcome of youth tobacco use was comprised of cigarette use and cigar use.

Organization of the Chapters

Chapter 2 consists of the literature review about the overall tobacco environment, prevalence of youth tobacco use, tobacco products used by youth, factors associated with youth tobacco use, health effects of tobacco use, public policy in youth tobacco use, tobacco-free school policies, and effectiveness of tobacco-free school policies. Chapter 3 discusses the reasoned action approach and the social ecological model, which were the two theories chosen as the basis for the theoretical framework in this study. Chapter 4 details the research methodology used in this study and describes the research design, sampling method, data collection, identification of the independent and dependent variables, measurement of the variables, and analytical methods. Chapter 5 explains the findings and hypothesis testing. Chapter 6 offers a summary of hypothesis testing and discusses the theoretical and practical contributions, limitations of the study, and recommendations for future studies.

CHAPTER 2. LITERATURE REVIEW

The literature review is designed to provide a comprehensive understanding of the background and context of the study problem of youth tobacco use and serve as a foundation for this study. In this chapter, the following topics are discussed: tobacco use in the United States, prevalence of youth tobacco use, tobacco products used by youth, factors associated with youth tobacco use, health effects of tobacco use, public policy in youth tobacco use, tobacco-free school policies, and effectiveness of tobacco-free school policies.

Tobacco Use in the United States

In the United States, the widespread use of tobacco began over a century ago, and the epidemic of tobacco-caused diseases and premature mortality that is associated with tobacco use has continued until today (U.S. DHHS, 2014). In 2010, "19.3% of U.S. adults were current cigarette smokers" (King, Dube, Kaufmann, Shaw, & Pechacek, 2011, p. 1208). The 2014 National Health Interview Survey (NHIS) estimated that 40.0 million people in the United States, or 16.8% of all adults ages 18 years old or over, were current cigarettes smokers in 2014 (Jamal et al., 2015). A current smoker was defined in the NHIS as an individual who has reported smoking at least 100 cigarettes during his or her lifetime and who has reported smoking every day or some days at the time of the interview. In 2014, more men (18.8%) than women (14.8%) were cigarette smokers (Jamal et al., 2015). Based on U.S. Census region, smoking prevalence was significantly higher in the Midwest (20.7%) and South (17.2%) than in the Northeast (15.3%) and West (13.1%) (Jamal et al., 2015).

Prevalence of Youth Tobacco Use

Young people who are 12 to 17 years old around the country still initiate tobacco use despite the many years of research on the determinants of tobacco use among youth, the

widespread implementation of public health prevention programs, the health warnings about the dangers of smoking, the increasing social unacceptability of smoking, and the increasingly restrictive regulations and policies on smoking. Tobacco products that are used by youth include cigarettes, kreteks (clove cigarettes), bidis (flavored cigarettes), cigars, smokeless tobacco (e.g., snus, snuff, and dissolvable tobacco), hookahs, and electronic cigarettes (CDC, 2013b). This study examined youth tobacco use specifically related to cigarettes and cigars. The behaviors of smoking and smokeless tobacco use are primarily established during adolescence. Early initiation of smoking is "a major risk factor for regular smoking in late adolescence and young adulthood" (Ellickson, Orlando, Tucker, & Klein, 2004, p. 295).

According to the 2014 National Youth Tobacco Survey (NYTS), the prevalence of current tobacco use in that year was 7.7% among middle school students and 24.6% among high school students (Arrazola et al., 2015). The 2014 NYTS indicated that 2.5% of middle school students and 9.2% of high school students smoked cigarettes in 2014 (Arrazola et al., 2015). At the same time, 1.9% of middle school students and 8.2% of high school students smoked cigars (Arrazola et al., 2015). Nearly 90% of smokers began the habit by the age of 18, and 99% of smokers started by the age of 26 (CDC, 2012). Twenty percent of youth in the United States will try smoking cigarettes by 8th grade, and 42% will do the same by 12th grade (Johnston, O'Malley, Bachman, & Schluelenberg, 2011). More than 380,000 individuals who are 12 to 13 years old and nearly four million individuals who are 14 to 17 years old have smoked cigarettes (Office of Adolescent Health, 2014). Each day, more than 3,800 individuals under the age of 18 smoke their first cigarette in the United States, while more than 1,000 youth become daily cigarette smokers (CDC, 2012). Although youth tobacco use has noticeably declined in the past

four decades, nearly 10% of high school seniors in 2013 were daily smokers (Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2014).

The "transition from tobacco experimentation to regular tobacco use typically occurs during young adulthood" (CDC, 2012; Hammond, 2005; Steinberg & Delnevo, 2013, p. 558). Young people who do not begin using tobacco products regularly by the age of 18 will most likely never start (CDC, 2012). This probability supports the need for prevention programs aimed at youth in the United States.

Despite the progress made in the reduction of tobacco use, certain groups in the United States "remain at high risk for tobacco use and suffer disproportionately from tobacco-related illness and death" (Fagan et al., 2004, p. 211). Substantial racial and ethnic disparities, as well as regional differences, exist in smoking rates. White teenagers are more likely to smoke than black or Hispanic teenagers (Kann et al., 2014). Smoking rates are usually higher in rural areas, as well as in the Southern and Midwestern regions of the United States (Substance Abuse and Mental Health Services Administration [SAMHSA], 2013; Office of Adolescent Health, 2014). Smoking prevalence was higher among youth living below the poverty level (7.6%) compared to youth living at or above the threshold (6.2%) (U.S. DHHS, 2014).

Factors Associated with Youth Tobacco Use

The literature on youth tobacco use abounds with examples of multilevel models examining "the relative influence of community-level, school-level, and individual-level risk and protective factors for tobacco use" (Adams, Jason, Pokorny, & Hunt, 2009; Ali & Dwyer, 2009; Barnett et al., 2007; CDC, 2012, p. 459; Ennett et al., 2010; Kelly et al., 2010; Mayberry, Espelage, & Koenig, 2009; McVicar, 2011; Paek, Hove, & Oh, 2013; Steen, 2010; Turner, Mermelstein, & Flay, 2004; Wen, Van Duker, & Olson, 2009). Adolescents are especially

susceptible to social and environmental influences to use tobacco at their current developmental stage (CDC, 2012). Certain studies suggest that "proximal social influences," which are individual, peer, and parental influences, "are particularly potent predictors of tobacco use among young people" because they have "a stronger, more direct, and more immediate influence than do macro-level factors," such as the school climate and community norms (CDC, 2012, p. 459). However, these macro-level factors are also strong predictors because they are inescapable in society, and they have a strong effect on the proximal social influences (CDC, 2012). Tobacco-free school policies are an example of a macro-level factor in youth tobacco use.

Social Environment

The large social environment is comprised of religion, race, ethnicity, and culture; gender; socioeconomic status; educational and academic achievement; school environment; and extracurricular and organized activities (CDC, 2012). It contains "the norms within a society about whether, when, and for whom smoking is acceptable" (CDC, 2012, p. 431), and it also incorporates many macro-level "social processes that affect tobacco use by influencing social norms" (CDC, 2012, p. 438).

Certain features of the school environment can "either promote or protect against youth smoking behavior" (CDC, 2012, p. 435). An example is "the tolerance of smoking activity among students or teachers anywhere on the school grounds" (CDC, 2012, p. 435; Ennett, Flewelling, Lindrooth, & Norton, 1997; Poulsen et al., 2002; Sussman, Dent, Burton, Stacy, & Flay, 1995). Youth who witness adults or other adolescents smoking in a public place, such as a school, are "more likely to perceive smoking as a socially acceptable behavior" (Alesci, Forster, & Blaine, 2003; CDC, 2012, p. 435). Therefore, the perception of tobacco use on school property may promote social norms that encourage youth to become and remain smokers (CDC, 2012).

Conversely, policies that ban smoking in various locations will reduce the visibility and decrease the acceptability of smoking in these locations (Alesci et al., 2003). Comparisons between schools with "high versus low smoking rates" have discovered that "attending a school with a relatively high smoking rate leads to greater susceptibility to smoking among nonsmoking students" (CDC, 2012, p. 435; Leatherdale, McDonald, Cameron, Jolin, & Brown, 2006). This situation also "increases the odds of ever smoking and current smoking" (CDC, 2012, p. 435; Ennett, Flewelling, Lindrooth, & Norton, 1997; Leatherdale & Manske, 2005; Leatherdale, McDonald, Cameron, & Brown, 2005).

Physical Environment

The large physical environment, or built environment, consists of "features of public and private spaces that may make tobacco use more or less tolerated or enjoyable" (CDC, 2012, p. 437). Such features of the environment that encourage smoking include the following: "the tolerance of this activity in public spaces; proximity to entertainment, recreation, and social interaction; and locations that are relatively unlikely to be supervised by adult" (CDC, 2012, p. 437), as well as "the availability of comfortable and convenient places to smoke; the availability of or access to tobacco products; and cues from the media to use tobacco" (CDC, 2012, p. 439). Individuals who have fewer social bonds to institutions like schools and places of worship are more likely to use tobacco (CDC, 2012; Choi, Ahluwalia, Harris, & Okuyemi, 2002; Evans-Whipp et al., 2004; Metzger, Dawes, Mermelstein, & Wakschlag, 2011; van den Bree, Whitmer, & Pickworth, 2004).

Small Social Groups

Family groups and peer groups are the two types of small social groups that play the most important roles "in the development of young people and their use of tobacco" (CDC, 2012, p.

439). The attitudes and behaviors of individuals in these small social groups lead to an individual's normative beliefs, which are considered in the reasoned action approach. A family serves as a source of social, genetic, and biological factors (CDC, 2012). Smoking by parents is the "most frequently assessed parental risk factor for smoking by youth, given the central role that parents serve in young people's lives," so parental smoking may promote the behavior among young people (CDC, 2012, p. 443). Despite whether their parents use tobacco themselves, teenagers are less likely to start using tobacco products if their parents strongly disapprove of their tobacco use. There is evidence that parental disapproval counteracts peer influence (CDC, 2012). However, the 2012 results of the Florida Youth Tobacco Survey (FYTS) revealed that only 50.4% of high school students had discussed the hazards of tobacco use with a parent or guardian in the past year (Tobacco Free Florida, 2012c).

According to the CDC (2012), sufficient evidence exists to conclude "that there is a causal relationship between peer group social influences and the initiation and maintenance of smoking behaviors during adolescence" (p. 10). Several cross-sectional and longitudinal studies have revealed that peer factors are associated with an adolescent's own smoking behavior (Alesci et al., 2003; Ali & Dwyer, 2009; CDC, 2012; Conrad, Flay, & Hill, 1992; Jackson, 1997; Kim, Fleming, & Catalano, 2009; Kobus, 2003; McVicar, 2011; Tyas & Pederson, 1998; U.S. DHHS, 1994; Villanti, Boulay, & Juon, 2011), particularly "friends' smoking behavior and adolescents' perceptions of their friends' smoking behavior" (CDC, 2012, p. 439). Peer groups can be interaction-based or identity-based. A large peer group, such as one from school, is the common reference group that young people use to estimate smoking rates. This large peer group can indicate a student's normative expectations about smoking behaviors (Botvin, Botvin, Baker, Dusenbury, & Goldberg, 1992; CDC, 2012; Sherman, Presson, Chassin, Corty, & Olshavsky,

1983; Sussman et al., 1988). Young people are more likely to use tobacco products if their peers do and if they perceive tobacco use to be an acceptable behavior among their peers. Reid, Manske, and Leatherdale (2008) discovered that adolescents who overestimate peer smoking prevalence are more likely to smoke, and more than three-quarters of students in their study had overestimated the within-grade smoking rate at their own school.

Other Individual Factors

Cognitive and affective processes play a role in youth tobacco use. Expectations of positive or negative outcomes from smoking are "conscious, explicit, and planned" cognitive processes (CDC, 2012, p. 447). These expectations comprise an individual's behavioral beliefs, which are also considered in the reasoned action approach. A strong relationship exists between youth smoking and negative feelings, such as stress, anxiety, and depression (CDC, 2012). Many cross-sectional studies have concluded that there are positive associations between adolescent tobacco use or nicotine dependence and depressive symptoms or a diagnosis of depression (Acierno et al., 2000; CDC, 2012; Dierker, Avenevoli, Merikangas, Flaherty, & Stolar, 2001; Kim et al., 2009; Martini, Wagner, & Anthony, 2002; Patton et al., 1998). Other individual influences on youth tobacco use include the following: low socioeconomic status (CDC, 2012; CDC, 2014c; Garrett, Dube, Trosclair, Caraballo, & Pechacek, 2011; Gilman, Abrams, & Buka, 2003; U.S. DHHS, 1994), low levels of academic achievement (CDC, 2012; CDC, 2014c; Garrett et al., 2011; Morin, Rodriguez, Fallu, Maiano, & Janosz, 2012; U.S. DHHS, 1994), low self-image or self-esteem (CDC, 2014c; U.S. DHHS, 1994), lack of skills to resist influences to use tobacco (CDC, 2014c; U.S. DHHS, 1994), and aggressive behavior (CDC, 2014c; Leff et al., 2003).

Health Effects of Tobacco Use

Many young people do not consider the long-term health effects associated with tobacco use when they begin using tobacco products. Each tobacco product has a list of negative health effects associated with its use.

Health Effects of Cigarettes

Smoking can damage almost every organ of the human body. Smoking-related cancers include the following: bladder, blood, colon and rectum, esophagus, kidney and ureter, larynx, liver, oropharynx, pancreas, stomach, trachea, bronchus, and lung (CDC, 2014b). Cigarette smoking has been linked to nearly 90% of all cases of lung cancer (CDC, 2014b). Smoking is a risk factor for emphysema, chronic bronchitis, and other lung diseases. It can aggravate asthma symptoms and increase the risk of heart disease (National Institute on Drug Abuse, 2009).

Health consequences of smoking during adolescence include reduced lung function, impaired lung growth, and diagnosis of asthma in susceptible populations (CDC, 2012). It may also lead to early abdominal aortic atherosclerosis, which is a disease in which plaque builds up inside of arteries (CDC, 2012).

Secondhand smoke (SHS) is also a serious problem. SHS is "the combination of the smoke given off by a burning tobacco product and the smoke exhaled by a smoker" (National Cancer Institute, 2011, What is Secondhand Smoke section, para. 1). It contains a mix of more than 7,000 harmful chemicals. At least 69 chemicals found in SHS are known to cause cancer, and there is no safe level of exposure to it. Other health problems that have been linked to SHS include heart disease, sudden infant death syndrome (SIDS), ear infections, asthma attacks, bronchitis, and pneumonia (National Cancer Institute, 2011). In the United States, it ultimately results in approximately "46,000 heart disease deaths and 3,400 lung cancer deaths" among

nonsmoking adults annually (U.S. DHHS, 2006, p. 8). Over the last 50 years in this country, 2.5 million nonsmokers have died as a result of exposure to SHS (U.S. DHHS, 2014).

Health Effects of Cigars

Although cigars are thought to be less harmful than regular cigarettes, they lead to similar negative health consequences. Studies have shown that regular cigar smokers are between four to 10 times more likely to die from cancers of the mouth, larynx, and esophagus than nonsmokers. For those who inhale when they use cigars, cigar smoking appears to also be linked to death from cancer of the pancreas and bladder (American Cancer Society, 2014).

Cigars give off greater amounts of SHS than cigarettes because they contain more tobacco, and they also burn for a longer period of time. All tobacco smoke, whether from cigarettes, pipes, or cigars, is known to cause cancer. In general, SHS from cigars contains many of the same toxins and carcinogens, which are cancer-causing agents, as cigarette smoke (American Cancer Society, 2014).

Tobacco-Attributable Losses

Tobacco use is the leading cause of preventable disease and premature death in the United States. It kills over 480,000 individuals in the United States each year (Jamal et al., 2015). This equals approximately one of every five deaths in the country. Each year, cigarette smoking "has been estimated to cost the United States $96 billion in direct medical expenses and $97 billion in lost productivity" (Agaku, King, & Dube, 2012, p. 889). The number of adults in Florida who die each year from their own smoking equals 32,300 (Campaign for Tobacco-Free Kids, 2015). If smoking continues at the current rate among youth in the United States, 5.6 million people under the age of 18 today "are projected to die prematurely from a smoking-

related illness" (U.S. DHHS, 2014, p. 679). This represents approximately one in every 13 U.S citizens who are 17 years old or younger alive today (U.S. DHHS, 2014).

The annual healthcare costs in Florida directly caused by smoking are $8.64 billion. The portion covered by the state Medicaid program equals $1.51 billion. For Florida residents, the state and federal tax burden from government expenditures caused by smoking equals $791 per household. Productivity losses caused by smoking in Florida equal $8.32 billion (Campaign for Tobacco-Free Kids, 2015). These monetary amounts do not include health costs that were caused by exposure to SHS, fires caused by smoking, smokeless tobacco use, or cigar and pipe smoking. Additional costs, such as workplace productivity losses and damages to property, can also be a result of tobacco use (Campaign for Tobacco-Free Kids, 2015). In Florida, more deaths are caused by tobacco use than alcohol use, human immunodeficiency virus (HIV), illegal drug use, motor vehicle injuries, murders, and suicides combined (Campaign for Tobacco-Free Kids, 2015; Mokdad, Marks, Stroup, & Gerberding, 2004).

Public Policy on Tobacco Use

Public policy promotes changes in individuals' behavior through federal laws, state laws, school board resolutions, curricula, and program guidelines. In a public health framework, policy functions as "a guide to action to change what would otherwise occur" and "a statement of commitment to certain areas of concern" (Milio, 2001, p. 622). Public policy includes the policies that are implemented at any level of government (Milio, 2001). Healthy public policy "improves the conditions under which people live" to provide "secure, safe, adequate, and sustainable livelihoods, lifestyles, and environments" (Milio, 2001, p. 622). The macro-theoretical approach to policy research involves units at the organization, community, state, or national levels.

Various types of public policies have been developed and implemented on each governmental level in the United States in order to fight the problem of tobacco use, especially involving youth. The World Health Organization (WHO) produced a summary of the essential elements of tobacco control strategy, which is identified by the acronym MPOWER. The six components of MPOWER are the following: "monitor tobacco use and prevention policies; protect people from tobacco smoke; offer help to quit tobacco use; warn about the dangers of tobacco; enforce bans on tobacco advertising, promotion, and sponsorship; and raise taxes on tobacco" (WHO, 2014b, The Six Components of MPOWER section).

The main legislative and regulatory approaches to control youth tobacco use are taxation on tobacco, policies for clean indoor air, regulations on youth access, bans on advertising for tobacco, and limitations on product labeling (CDC, 2012). Successful comprehensive tobacco control programs include several strategies, such as smoke-free laws and policies, increased tobacco prices, mass media campaigns, evidence-based school programs, and sustained community-wide efforts (CDC, 2012). Among the available policy options to reduce tobacco use, the ones that are able to prevent youth from smoking are relatively sustainable and cost-efficient when they are compared to other policy options. A smoke-free policy is one method to achieve prevention. In general, evidence suggests that policies that prohibit smoking create anti-smoking social norms and ultimately decrease smoking behavior. Conversely, "exposure to pro-tobacco media messages, particularly in movies or advertising, increases perceptions of the acceptability of smoking and thus increases smoking behavior" (CDC, 2012, p. 439). Many locations are designated as smoke-free due to the potential effects of tobacco use and SHS on youth. Counter-advertising mass-media campaigns include television and radio commercials, posters, and other media messages targeted towards youth to offset pro-tobacco marketing (CDC,

2014c). In Florida, tobacco companies spend more than $700 million in marketing annually. They consider it to be an investment to help replace the people that die from smoking, which equates to 1,200 individuals each day. They are trying to replace them with teenagers, which have been referred to as replacement smokers (Tobacco Free Florida, 2012b).

Community programs along with school and college policies and interventions can be planned and implemented in order to create tobacco-free social norms. Community interventions can reduce tobacco advertising, promotions, and commercial availability of tobacco products. Also, increasing excise taxes leads to higher costs for tobacco products, while prohibiting smoking at worksites and public places can reduce tobacco use and exposure to SHS (CDC, 2014a; CDC, 2014c).

Tobacco-Free School Policies

Most school districts across the United States had adopted a policy or regulation related to tobacco smoking by the late 1980s (CDC, 1989), and "the enactment of the federal Pro-Children Act of 1994 prompted the majority of schools to create additional tobacco-related policies" (Terry & Zhang, 2016, p. 130). The Pro-Children Act of 1994 prohibited smoking in facilities that were funded by the federal government and provided "education, library, daycare, healthcare, and early childhood development services to children" (Pro-Children Act of 1994, 1994; Terry & Zhang, 2016, p. 130). This act states, "No person shall permit smoking within any indoor facility (or portion thereof) owned or leased or contracted for and utilized by such person for the provision of routine or regular kindergarten, elementary, or secondary education or library services to children" (Pro-Children Act of 1994, 1994). It applied to any school and program that was "funded by the federal government or through state and local governments by federal grant, loan and loan guarantee, or contract programs" (Terry & Zhang, 2016, p. 130). The

requirements in the Pro-Children Act of 1994 were reauthorized by the No Child Left Behind Act of 2001 (Public Health Law Center at William Mitchell College of Law, 2010).

In 1994, the Surgeon General published the first report that examined the prevention of tobacco use among young people by considering years of research conducted on a wide variety of school-based programs. The results in this report revealed consistent success in the reduction of tobacco use in the population of middle school and high school students as a result of these programs (U.S. DHHS, 1994). Adolescents spend much of their time each day, equivalent to about one-third of their waking hours, in a school environment in which they are exposed to risk factors associated with smoking. Therefore, the Centers for Disease Control and Prevention (CDC) has recommended that schools should develop and enforce a tobacco-free school policy to prevent and reduce youth smoking. The CDC stated there is evidence that school programs that prohibit tobacco use are effective in the prevention of tobacco use when they are designed and implemented well (CDC, 1994). Schools are natural venues for reaching out to youth through school-based programs that are designed to prevent youth from beginning a smoking habit, as well as reduce the rate at which youth are involved in tobacco use. Policies and programs at the school level are intended to raise awareness about the consequences of tobacco use and ultimately create environments that are not conducive to smoking. To ensure that school tobacco prevention programs have the greatest impact, the CDC School Guidelines recommend that schools:

> "1. Develop and enforce a school policy on tobacco use;
>
> 2. Provide instruction about the short- and long-term negative physiological and social consequences of tobacco use, social influences on tobacco use, peer norms regarding tobacco use, and refusal skills;

3. Provide tobacco-use prevention education in kindergarten through 12th grade; this instruction should be especially intensive in junior high or middle school and should be reinforced in high school;

4. Provide program-specific training for teachers;

5. Involve parents or families in support of school-based programs to prevent tobacco use;

6. Support cessation efforts among students and all school staff who use tobacco; and

7. Assess the tobacco-use prevention program at regular intervals" (CDC, 1994, p. 7).

The CDC School Guidelines (CDC, 1994) were developed through consultation with experts from national education, health, and medical associations and societies. They recommend that school policies on tobacco use prohibit the use of tobacco products by all persons, including students, faculty and staff, and visitors, on all school property, in school vehicles, and at all school-sponsored events held both on and off school property, and that the policies be communicated to students, school staff, parents, visitors, and members of the community. Tobacco prevention programs at schools will be most effective if they accomplish the following objectives: "prohibit tobacco use at all school facilities and events at all times; encourage and help students and staff to quit using tobacco; provide developmentally appropriate instruction in grades K–12 that addresses the social and psychological causes of tobacco use; are part of a coordinated school health program through which teachers, students, families, administrators, and community leaders deliver consistent messages about tobacco use; and are implemented within the context of and reinforced by communitywide efforts to prevent tobacco use and addiction" (CDC, 2013c). Sufficient evidence supports the notion that school-based programs

containing particular components can produce at least short-term effects and lead to a reduction in tobacco use prevalence among school-aged youth (CDC, 2012).

School policies on tobacco use affect the current and future use of tobacco, and in doing so, generate an impact on the health of an entire community. Comprehensive tobacco-free school policies are a significant step towards building healthier communities. These types of policies have been suggested as an important component of comprehensive, multi-component efforts to prevent tobacco use (Barnett et al., 2007; CDC, 1989). They create a safe and healthy environment for all students, faculty, and staff. They also send a clear message that tobacco use is dangerous, and it is not a socially acceptable behavior. Adult employees and visitors provide positive role modeling when they do not use tobacco around youth. Tobacco use can be de-normalized through positive role modeling. If students do not see teachers, school faculty, coaches, parents, or visitors using tobacco products, they will be less likely to view tobacco use as an acceptable behavior and ultimately will be less likely to start using it due to their reduced observation of tobacco use (Tobacco Free Florida, 2014b). According to Barnett et al. (2007), school policies which ban "smoking by teachers and school personnel within and outside the school should be a key element of comprehensive smoking prevention programs" aimed at adolescents (p. 842). Tobacco-free schools also reduce exposure to SHS, which ultimately leads to safer environments for students, and encourage tobacco users to consume less of the product and possibly quit (Tobacco Free Florida, 2014b). Schools that do not commit to being smoke-free send conflicting messages to their students about the hazards of using tobacco products and the health consequences of SHS (Tobacco Free Florida, 2014b). The observation of others using tobacco strongly influences children. A no-tolerance policy towards tobacco enables school administrators to take a stronger stand. It "allows staff, volunteers, parents, and students to

participate in enforcement and sends a stronger prevention message to young people" (North Dakota Department of Health, 2010, p. 6).

To fight the problem of youth tobacco use, many state departments of education and local school districts "are adopting comprehensive tobacco-free policies, which ban tobacco products on school property, including both indoor and outdoor areas, as well as school functions," and schools are making efforts to educate students and staff about the hazards of tobacco use (Public Health Law Center at William Mitchell College of Law, 2010, para. 3). Prevention efforts aimed towards youth are essential in comprehensive prevention programs because the majority of tobacco users become addicted to nicotine as teenagers. Efforts at the national and state levels that "encourage adoption and enforcement of comprehensive tobacco-free school policies" can significantly reduce tobacco use among youth (Summerlin-Long & Goldstein, 2008, p. 625). In recent years, the importance of schools addressing health promotion and risk factor prevention has become noticeable (Bonell et al., 2010; Galanti, Coppo, Jonsson, Bremberg, & Faggiano, 2014). According to the CDC School Health Policies and Programs Study from 2006, 70% of states and 95% of school districts included in a nationally representative sample banned "smoking by students in school buildings, grounds, vehicles, and off-campus school-sponsored events" (Jones, Fisher, Greene, Hertz, & Pritzl, 2007; CDC, 2012, p. 707). On the other hand, only 47% of the states but 78% of the school districts "had smoke-free schools in which the same restrictions applied to the staff" (CDC, 2012, p. 707).

The School Health Policies and Programs Study (SHPPS) is a national survey used "to assess school health policies and practices at the state, district, school, and classroom levels" (CDC, 2013a). The 2012 SHPPS collected data at the state and district levels to find that 98.9% of districts "had adopted a policy prohibiting cigarette smoking among students," 94.2% of

districts “had adopted a policy prohibiting smokeless tobacco use among students,” and 94.8% of districts “had adopted a policy prohibiting cigar or pipe smoking among students” (CDC, 2013a, p. 97). The majority of districts also “had adopted a policy prohibiting cigarette smoking (95.1%), smokeless tobacco use (89.9%), and cigar or pipe smoking (92.8%) among faculty and staff” (CDC, 2013a, p. 97). Similarly, most districts “had adopted a policy prohibiting cigarette smoking (96.2%), smokeless tobacco use (90.3%), and cigar or pipe smoking (93.4%) among visitors” (CDC, 2013a, p. 97). In regard to the issue of tobacco control, Healthy People 2020 has set an objective (TU-15.1, TU-15.2, TU-15.3) to “increase tobacco-free environments in junior high schools, middle schools, and high schools, including all school facilities, property, vehicles, and school events” (Healthy People, 2014).

Tobacco-free school policies in Florida. In some states, school district boundaries have been unified with other municipal boundaries, particularly county boundaries. County school systems are standard in Florida, Georgia, Louisiana, Maryland, Nevada, South Carolina, and West Virginia (Center for the Study of Education Policy, 2009). In the Florida Revised Statutes § 1001.30, each county comprises a school district. Florida is comprised of 67 counties. Additionally, in the Florida Revised Statutes § 1000.04 and the Florida Revised Statutes § 1003.51, there are four laboratory schools operated by Florida A&M University, Florida Atlantic University, Florida State University, and the University of Florida, the Florida School for the Deaf and Blind, the Florida Virtual School, and the Okeechobee Youth Development Center, which is administered through the Florida Department of Juvenile Justice by a private contractor. Overall, there are 74 districts in the state of Florida.

According to an Advisory Legal Opinion (AGO 2010-53) issued in December 2010 by the former Florida Attorney General Bill McCollum, “a school district was precluded from

regulating smoking on school property other than prescribed in the Florida Clean Indoor Air Act," regardless of the school district home rule power granted in the Florida constitution (Florida Office of the Attorney General, 2011; Terry & Zhang, 2016, p. 130). This statement was in response to a question asked by the Chief Counsel of the Palm Beach County School District, Bruce A. Harris, about whether the Florida Clean Indoor Air Act precluded a school district from adopting a tobacco-free campus policy which prohibits smoking outdoors on school grounds (Florida Office of the Attorney General, 2011). Due to "the clear preemption of the area of smoking regulation to the state and the specific statutory language addressing smoking on school property," it did not appear that the Florida Legislature had "contemplated that a school board's home rule power may be exercised to regulate smoking on school property in a manner other than prescribed in the act" (Florida Office of the Attorney General, 2011). At this time, the Florida Clean Indoor Air Act (2010) expressly preempted the "regulation of smoking to the state and supersedes any municipal or county ordinance on the subject."

Preemption is "the ability of a higher level of government to prevent or prohibit certain actions at a lower level of government" (Public Health Law Center at William Mitchell College of Law, 2010, Legal Issues section, para. 1). The "enactment of state or local policies that prohibit tobacco use in schools" is not preempted by federal law (Terry & Zhang, 2016, p. 130). However, it is possible that some states have "laws that prohibit smoking in educational facilities" that "preempt local laws on the subject" (Public Health Law Center at William Mitchell College of Law, 2010; Terry & Zhang, 2016, p. 130).

In June 2011, "Florida Governor Rick Scott signed a law to amend the Florida Clean Indoor Air Act to give public school districts the authority to implement policies designating all district property as tobacco-free if they choose to do so" (Terry & Zhang, 2016, p. 130). Then,

the Florida Clean Indoor Air Act (2011) expressly preempted the "regulation of smoking to the state and supersedes any municipal or county ordinance on the subject; however, school districts may further restrict smoking by persons on school district property." In the realm of public health promotion and disease prevention efforts, the term comprehensive is often used to describe programs that are multidimensional. A comprehensive tobacco-free school policy in Florida public school districts must include 12 components based on the CDC's "Guidelines for School Health Programs to Prevent Tobacco Use and Addiction" (CDC, 1994). Florida public school districts that have comprehensive policies restrict smoking and the use of all other tobacco products on all of their properties and at all of their events. According to the Bureau of Tobacco Free Florida, the 12 components of a comprehensive tobacco-free school policy in Florida are the following:

> "1. Policy includes a statement of rationale for the policy and definitions of tobacco and tobacco use;
>
> 2. Tobacco is specifically named; not implied by prohibiting drugs;
>
> 3. All components of the policy are effective 24 hours a day; 365 days per year;
>
> 4. All school buildings, grounds, campuses, housing, property (including vehicles and buses) whether owned or leased are tobacco free at all times;
>
> 5. Students are prohibited from possessing and/or using tobacco products on school grounds, at school events, whether on or off district property;
>
> 6. School staff are prohibited from using tobacco products on school grounds, at school events, whether on or off district property;
>
> 7. Visitors are prohibited from using tobacco products on school grounds, at school events, whether on or off district property;

8. Wearing clothing or using other items that advertise or promote tobacco products is prohibited;

9. Tobacco advertising and acceptance of gifts, including curriculum, from tobacco companies is prohibited;

10. A plan to communicate the policy to all students, employees and visitors is outlined;

11. An enforcement plan for students, staff and visitors is outlined;

12. An enforcement plan for students and staff that provides cessation resources is outlined" (Tobacco Free Florida, 2012a).

Since the amendment was passed in June 2011, an increasing number of public school districts in Florida have become 100% tobacco-free indoors and outdoors. County-level staff members from the 67 public school districts in Florida "self-reported the components of their tobacco-free school policy to the Bureau of Tobacco Free Florida as of January 1, 2014" (Terry & Zhang, 2016, p. 131). Figure 1 shows a color-coded map of Florida public school districts based on the comprehensive level of tobacco-free school policies (Tobacco Free Florida, 2014b). Thirty public school districts include 12 of 12 components in their tobacco-free school policies. Twenty public school districts include 9 to 11 components. Eleven public school districts include 4 to 8 components. Six public school districts include less than 4 components (Tobacco Free Kids, 2012).

The first component is included in 58 tobacco-free school policies. The second component is included in 64 tobacco-free school policies. The third component is included in 56 tobacco-free school policies. The fourth component is included in 60 tobacco-free school policies. The fifth component is included in 61 tobacco-free school policies. The sixth component is included in 54 tobacco-free school policies. The seventh component is included in

55 tobacco-free school policies. The eighth component is included in 57 tobacco-free school policies. The ninth component is included in 42 tobacco-free school policies. The tenth component is included in 52 tobacco-free school policies. The eleventh component is included in 48 tobacco-free school policies. The twelfth component is included in 40 tobacco-free school policies.

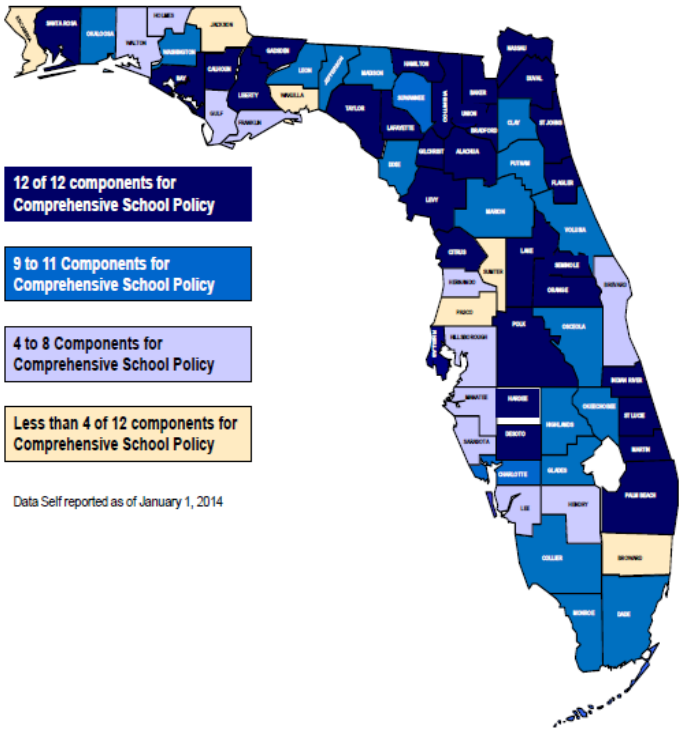

Figure 1. Comprehensiveness Levels of Tobacco-Free School Policies

Effectiveness of tobacco-free school policies. Prior to the 1994 Surgeon General's report (U.S. DHHS 1994), researchers and educators suggested that school smoking policies could reduce youth smoking. For example, Pentz et al. (1989) examined the impact of school policies on adolescents in California and concluded that they were associated with lower smoking prevalence in that population. The overall literature on the effectiveness of school smoking policies is limited. This may be a result of such policies being widely applied to students and schools (CDC, 2012). Although policy offers an inexpensive widespread approach

to the reduction of youth tobacco use, the impact of these policies has been mixed. There is evidence corroborating the notion that the presence of a policy alone does not lead to significant reductions (Adams et al., 2009; Griesbach, Inchley, Currie, 2002; Murnaghan, Sihvonen, Leatherdale, & Kekki, 2007; Wakefield et al., 2000).

Research suggests that school policies which prohibit tobacco use and are consistently enforced are necessary to lower smoking rates among teenagers. Tobacco-related policies need "to be enforced and should foster a proactive approach by schools to prevention" in order to be effective (CDC, 2012, p. 788). Although most states have clean indoor air laws that prohibit smoking within school buildings, variations exist within local school policies "as to whether all tobacco use, or just smoking, is prohibited on school property; whether tobacco use is also prohibited in outdoor areas on school grounds; and whether tobacco use is prohibited at off-campus school functions" (Public Health Law Center at William Mitchell College of Law, 2010, Select Legislation section, para. 2). The data yielded by a study by Adams et al. (2009) showed that the enforcement of school tobacco policies was associated with not only "fewer observations of tobacco use by minors on school grounds," but also a "lower rates of current smoking among students" (p. 17). Comprehensive policies that are not enforced may not be able to accomplish their objective of protecting children from the dangers of tobacco (Adams et al., 2009; Hahn et al., 2005). The results of a national study showed that school smoking bans could lower current smoking rates among students, but only when the school smoking bans were strongly enforced (Wakefield et al., 2000). Some ambiguity in understanding the relationship between tobacco-free school policies and youth smoking behavior comes from the strong "focus on students' perceptions of policy enforcement, with little evaluation of actual school policies or policy characteristics" (Sabiston et al., 2009, p. 1375). However, the comprehensiveness of those

policies might not be associated with the same changes. School personnel must receive training to be able to properly enforce the school tobacco policy that is implemented (Adams et al., 2009).

According to a systematic review conducted by Galanti et al. (2014), there is a high expectation for anti-tobacco policy to have an effective influence on young people's use of tobacco because such policies are inexpensive and easy to implement in a theoretical sense. Galanti et al. (2014) reasoned that the research in this field is poor due to a lack of a shared definition of what a school tobacco policy is, a majority of cross-sectional studies, and poorly described components of the policy. Also, the overall evidence of effectiveness is weak because there is a lack of experimental, quasi-experimental, and longitudinal studies. This proposed dissertation study is a longitudinal study that includes a quasi-experimental design. However, the systematic review highlights promising preventive components of an anti-tobacco policy, to be included in future evaluations, such as comprehensiveness, consistency, and enforcement (Galanti et al., 2014). There are certain policy dimensions and components suggested for formal evaluations of school tobacco policies. First, the policy dimension of comprehensiveness involves the following components: "targets, or the subjects in a school to which the policy applies; type of tobacco to which the rules apply; coverage of school premises; coverage of school activities and time; support of cessation facilities; combination with other smoking prevention programs; and combination with other policies" (Galanti et al., 2014, p. 300). The incorporation of each of the components of the tobacco-free school policy increases the public school district policy's comprehensiveness. Second, the policy dimension of degree of formality involves the following components: "form of statements; and approval issued by official school representative" (p. 300). Each public school district in the state of Florida has its own tobacco-

free school policy. Third, the policy dimension of enforcement involves the following components: “rules for surveillance; rules for referral of violation episodes; definition of the responsible person for policy evaluation and review; and agenda for periodic evaluation and review of the policy” (p. 300). The eleventh component of a comprehensive tobacco-free school policy in Florida is an outlined enforcement plan for students, staff, and visitors, and the twelfth component includes the provision of cessation resources in the enforcement plan. Fourth, the policy dimension of consequences involves the following components: “whether the on-site or delayed consequences of violations are defined for each target; fines; suspension from school; and other disciplinary action” (p. 300). Fifth, the policy dimension of communication involves the following components: “communication channels identified to inform on the policy; school website; school journal; posters in school premises; and newsletters” (p. 300). The tenth component of a comprehensive tobacco-free school policy in Florida is an outlined plan to communicate the policy to all students, employees, and visitors. Sixth, the policy dimension of the level of implementation involves component of “whether the policy is implemented at the national, regional, local, or school level” (p. 300). The tobacco-free school policies in Florida are implemented at the school district level.

Summary

Approximately 16.8% of adults in the United States were current cigarette smokers in 2014 (Jamal et al., 2015). During the same year, approximately 2.5% of middle school students and 9.2% of high school students around the country smoked cigarettes (Arrazola et al., 2015). Also, 1.9% of middle school students and 8.2% of high school students smoked cigars (Arrazola et al., 2015). Factors associated with youth tobacco use include the social environment, the physical environment, small social groups (i.e., family groups and peer groups), cognitive and

affective processes, low socioeconomic status, low levels of academic achievement, low self-image or self-esteem, lack of skills to resist influences to use tobacco, and aggressive behavior. Many harmful health effects are associated with smoking cigarettes and cigars, such as cancers, lung diseases, and heart disease. Exposure to SHS also leads to a variety of health problems. The types of legislative and regulatory approaches to control youth tobacco use in the United States include taxation on tobacco, policies for clean indoor air, regulations on youth access, bans on advertising for tobacco, and limitations on product labeling. One specific type of policy for clean indoor air is a comprehensive tobacco-free school policy, which creates a safe and healthy school environment for students, faculty, and staff. In June 2011, "Florida Governor Rick Scott signed a law to amend the Florida Clean Indoor Air Act to give public school districts the authority to implement policies designating all district property as tobacco-free if they choose to do so" (Terry & Zhang, 2016, p. 130). Now, each public school district in Florida has the opportunity to adopt 12 possible components in its tobacco-free school policy. As a result of different rates of policy adoption, not all Florida public school districts have comprehensive policies that restrict smoking and the use of other tobacco products on all of their properties or at all of their events.

This dissertation study builds on earlier studies and contributes to the literature on tobacco-free school policies. Although earlier studies have examined the direct impact of tobacco-free school policies on youth tobacco use in other states, there is a lack of attention to its determinants at additional levels of the social ecological model. The results of the studies were mixed. A statewide evaluation of comprehensive tobacco-free school policies based on the most recent data is much needed. This study addresses this gap in the literature by involving individual-level factors and interpersonal-level factors, in addition to policy-level factors.

CHAPTER 3. THEORETICAL FRAMEWORK

This chapter focuses on the development of a theoretical framework based on the reasoned action approach and the social ecological model to guide the conceptual relationships between individual and ecological factors and tobacco use in Florida public schools. The reasoned action approach is a social psychological theory that explains individual attitude and intention towards smoking behaviors, and the social ecological model furthers understanding of tobacco use from a broader spectrum. They are supplementary and interdependent when it comes to understanding the youth behavior of tobacco use in their social and educational environments.

The Reasoned Action Approach

History of the Reasoned Action Approach

Fishbein and Ajzen (1975) created the theory of reasoned action to predict behavior based on an individual's attitude and subjective norm, which is discussed below. This theory was later revised by Ajzen (1991) and extended into the theory of planned behavior in order to include perceived behavioral control, which is also discussed below. Afterwards, Fishbein and Ajzen developed the reasoned action approach together as a theory to explain and predict human behavior. Behavioral science theory and research can provide guidelines for the development of effective behavioral change interventions. Originating from the field of social psychology, this theory offers reasoning for the personal decision to use tobacco or to abstain from tobacco use among youth in middle schools and high schools. If there are known factors that underlie performance or nonperformance of a given behavior, there is a greater likelihood that a successful intervention can be designed to change or reinforce the particular behavior (Fishbein, 2008).

Assumptions of the Reasoned Action Approach

Human social behavior is assumed to "follow reasonably and often spontaneously from the information or beliefs people possess about the behavior under consideration" (Fishbein & Ajzen, 2010, p. 20). To put it simply, a reasoned action approach that is used to explain and predict social behavior assumes that a person's behavior follows reasonably from his or her beliefs about performing the behavior (Fishbein, 2008). A variety of sources influences these beliefs. These include personal experiences, interactions with family and friends, formal education, radio, newspaper, television, the Internet, and other media.

Constructs of the Reasoned Action Approach

Background factors consist of individual factors, social factors, and information factors. Individual factors include personality, mood and emotion, values and stereotypes, general attitudes, perceived risk, and past behavior. Social factors include age, gender, education, income, religion, race and ethnicity, and culture. Information factors include knowledge, media, and intervention. Although some critics of the reasoned action approach argue that this theory is overly rational, it is evident that these individual factors of mood, feelings, emotions, and compulsions are considered to play a role in behavior, which proves that it is not entirely rational (Fishbein & Ajzen, 2010).

Individual differences including demographic characteristics and personality can influence the experiences that people have, the sources of information to which they are exposed, and the ways they interpret and remember this information. Subsequently, individuals from different social backgrounds or with various personality traits are likely to hold diverse beliefs (Fishbein & Ajzen, 2010).

In the reasoned action approach, three types of beliefs – behavioral beliefs, normative beliefs, and control beliefs – are considered. First, behavioral beliefs are the beliefs about any positive or negative consequences that are experienced as a result of the performance of a certain behavior. In other words, these are outcome expectancies. Some may be correct, while others are incorrect. Behavioral beliefs are assumed to determine an individual's attitude towards personally performing a behavior based on his or her positive or negative outcome evaluation (Fishbein & Ajzen, 2010). A student may associate positive or negative consequences and outcome expectancies with tobacco use.

Second, normative beliefs are the beliefs established about whether the important individuals and groups in an individual's life would approve or disapprove of his or her performance of the behavior – also known as injunctive normative beliefs, as well as the beliefs that these important individuals and groups perform or do not perform the certain behavior themselves – also known as descriptive normative beliefs (Fishbein & Ajzen, 2010). These individuals might be in the small social groups (i.e., family groups and peer groups) that are fundamental "in the development of young people and their use of tobacco" (CDC, 2012, p. 439). These individuals may be a student's parents or his or her peers at school. In the context of youth tobacco use, an example of an injunctive norm is the belief about whether most of the important individuals in a young person's life approve or disapprove of tobacco use or cessation, as well as the degree of motivation to comply with these views. An example of a descriptive norm is the belief about whether most of the important individuals in a young person's life use tobacco products or have quit using tobacco products themselves. Combined, these injunctive and descriptive normative beliefs produce a perceived norm, which is the perceived social pressure to participate or not participate in the behavior. Perceived norms are influenced by one's

perceptions of the beliefs of the people and groups around them. The beliefs of other people are weighted by the importance that the individual attributes to these opinions, and they influence behavior intention of the individual (Fishbein & Ajzen, 2010).

Third, control beliefs are the beliefs that are formed about personal and environmental factors that can support or hinder an individual's attempts to carry out the behavior. Aggregately, these control beliefs result in a "perceived behavioral control" with regard to the performance of a behavior (Fishbein & Ajzen, 2010, p. 21). Perceived behavioral control is the perceived likelihood of the occurrence of various events that will facilitate or impede tobacco cessation, as well as the perceived impact that such events will have in making tobacco cessation easy or difficult for the student (Fishbein & Ajzen, 2010). If control beliefs include more inhibiting than facilitating factors, then perceived behavioral control should be low (Fishbein & Ajzen, 2010). For students facing the decision to use or not use tobacco, the knowledge of a tobacco-free school policy is an inhibiting factor, which lessens his or her control over the behavior.

Propositions of the Reasoned Action Approach

The attitude towards personally performing a behavior, the perceived norm, and the perceived behavioral control collectively lead to an individual's intention to perform a certain behavior. The behavior intention in this context is to quit using tobacco or remain a nonsmoker. This intention is considered to be the best predictor of change in behavior. According to the reasoned action approach, the more positive the attitude and the perceived norms are towards cessation and non-smoking, and the greater the perceived control is, the stronger the individual's intention will be to quit and/or avoid tobacco use. Actual behavioral control is comprised of "relevant skills and abilities," as well as "barriers to and facilitators of behavioral performance" in the environment (Fishbein & Ajzen, 2010, p. 21). It is acknowledged that a lack of requisite

skills and abilities, as well as the presence of environmental constraints, can prevent people from acting on their behavioral intentions (Fishbein & Ajzen, 2010). Thus, actual behavioral control "moderates the effect of intentions on behavior" (Fishbein & Ajzen, 2010, p. 21). A tobacco-free school policy is an example of a presence of environmental constraint.

It is important to realize that some behaviors may be entirely driven by "attitudinal considerations," while others are most strongly influenced by "normative considerations" (Fishbein, 2008, p. 839). Furthermore, a behavior that is attitudinally driven in one population or culture may actually be normatively driven in another population or culture. In some instances, one or more of the three factors – attitude, norm, or perceived behavioral control – may not "carry any significant weight in the prediction of intention" (Fishbein, 2008, p. 839). If this is the case, it merely indicates that the factor in question is not an "important consideration in the formation of intentions" for the particular behavior and population (Fishbein, 2008, p. 839). In the case of youth tobacco use among Florida high school students, while a student's perceived norm about tobacco use may be an important consideration in the formation of intentions to use tobacco products, a student's attitude towards tobacco use may not carry any significant weight in the prediction of his or her tobacco use. The relationships among the constructs are illustrated in Figure 2, which was created by Fishbein & Ajzen (2010, p. 22).

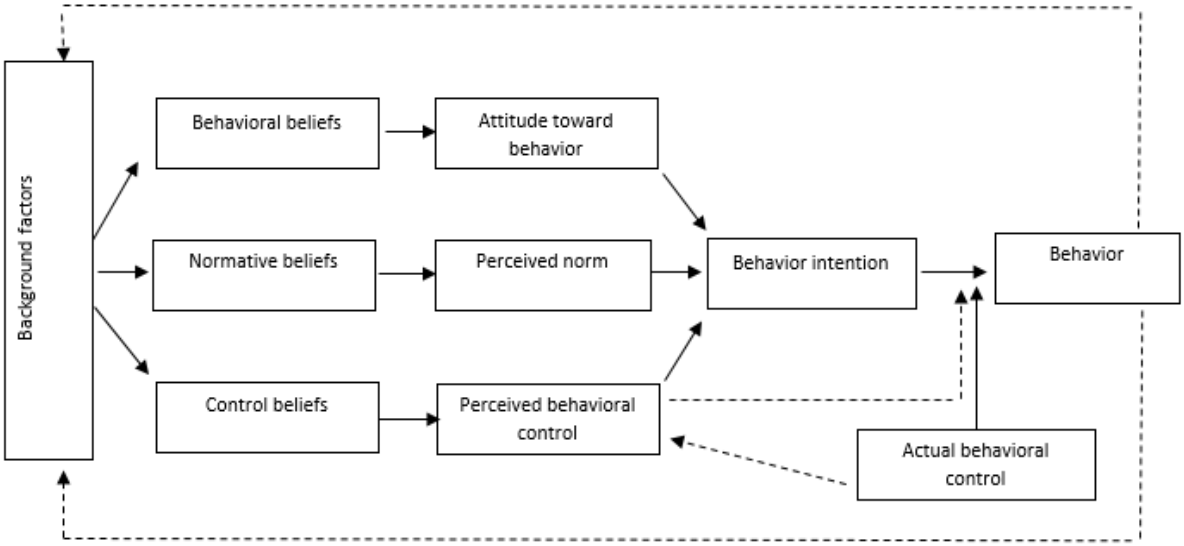

Figure 2. The Reasoned Action Approach

Applications of the Reasoned Action Approach in Other Studies

The reasoned action approach has been applied to a variety of topics related to health promotion, such as dietary choices (Sheats, Middlestadt, Ona, Juarez, & Kolbe, 2013), HIV prevention and risk-reduction strategies (Blank & Hennessy, 2012; Jemmott III, 2012), and the understanding of tailored internet smoking cessation messages (Curtis, 2012).

Although the reasoned action approach has not been widely incorporated into studies pertaining to youth tobacco use, the theory of reasoned action and theory of planned behavior mentioned above have been previously applied to youth smoking and tobacco use. Guided by the theory of reasoned action, conclusions were drawn that peer influences, including perceptions of the social consequences of smoking and perceived social norms, might increase youth susceptibility to smoking cigarettes (Unger, Rohrbach, Howard-Pitney, Ritt-Olson, & Mouttapa, 2001). Chalela, Velez, and Ramirez (2007) examined the predictive beliefs, attitudes, and social influences on youth smoking and discovered the importance of increasing understanding about the addictive nature of nicotine, developing adolescents' skills to resist the social and

environmental pressures to smoke, and addressing social influences to smoke. According to Maher and Rickwood (1997), the theory of planned behavior accounts for the predictors of adolescent smoking. Four particular variables – attitude towards smoking, perceived subjective norm, and perceived behavioral control over both smoking and not smoking – were found to best explain smoking intentions and smoking behavior among youth in a study conducted by ter Doest, Dijkstra, Gebhardt, and Vitale (2009). These two theories have also been considered together in studies on youth smoking behaviors (Guo et al., 2007; O'Callaghan, Callan, & Baglioni, 1999).

The Social Ecological Model

To build upon the theoretical insights from the reasoned action approach about the factors that influence an individual's behavior, the social ecological model provides reasoning for the inclusion of more than one of the five levels of influence in a multilevel examination of an individual's behavior. The five levels of influence are individual, interpersonal, organizational, community, and policy.

History of the Social Ecological Model

Turning now to a theory that explains the multilevel nature of tobacco control among youth, the social ecological model is explained and applied to this topic. Originating in the fields of psychology and human development, the social ecological model was adapted into the public health arena as a theoretical approach that emphasizes the importance of understanding social and regulatory environments in the prediction of individual health behavior (Flay, 1999; Kumpfer & Turner, 1990; Paek et al., 2013; Sabiston, 2009; Stokols, 1992; Stokols, 1996). It is a model of health that highlights the linkages and relationships among multiple factors affecting health (Institute of Medicine, 2003). This model emphasizes the importance of both the social

environment and physical environment that strongly shapes the patterns of disease and injury, as well as the responses to them over the life cycle (Fielding, Teutsch, & Breslow, 2010).

Assumptions of the Social Ecological Model

The social ecological model posits that the environment largely controls or sets limits on the behavior that occurs within it (Green, Richard, & Potvin, 1996), and it provides a philosophical underpinning for intervention strategies in the school environment, such as tobacco-free school policies (Wechsler, Devereaux, Davis, & Collins, 2000). In the social ecological model, four core assumptions exist about the dynamics of human health and the development of effective strategies to promote personal and collective well-being (Stokols, 1992). The core assumptions of the social ecological model emphasize the dynamics of interaction. Such interaction exists among people, environments, and other social influences that shape health behaviors and outcomes. These core assumptions outline the basic principles that are used in the conceptualization and evaluation of health promotion activities that are based on social ecology.

Three of these assumptions are especially pertinent to the examination of tobacco-free school policy (Paek et al., 2013). First, individual health and well-being are affected by a combination of multiple facets of both the physical environments and the social environments. As acknowledged in the literature, these are both factors in youth tobacco use. Second, an analysis of health and health promotion "should address the multidimensional and complex nature of human environments" (Paek et al., 2013, p. 680). They should not focus exclusively on environmental, biological, or behavioral determinants of well-being. Third, humans and their environments can be studied at varying levels, ranging "from the individual to the institutional to the communal and societal" levels (Stokols, 1996; Paek et al., 2013, p. 680).

Constructs of the Social Ecological Model

In the social ecological approach, the key determinant of health and illness is the "degree of fit between people's biological, behavioral, and sociocultural needs and the environmental resources available to them" (Stokols, 1996, p. 287). The focus of health promotion interventions is the integration of "behavioral and environmentally based health promotion strategies" (Stokols, 1996, p. 287), and these interventions emphasize a "combination of active and passive interventions that span individual, organizational, and community levels" (Stokols, 1996, p. 287). Active interventions require voluntary and sustained effort by target individuals, while passive interventions require no effort by the individuals who are exposed to them.

The five levels of influence within the social ecological model are individual, interpersonal, organizational, community, and policy. Individual factors include one's developmental history, knowledge, attitudes, behavior, self-concept, and skills (McLeroy, Steckler, Bibeau, & Glanz, 1988). Interpersonal factors encompass formal and informal social networks and social support systems (McLeroy et al., 1988). This interpersonal level is comprised of the small social groups (i.e., family groups and peer groups) mentioned above in the literature and the discussion of the reasoned action approach. Organizational factors include social institutions with organizational characteristics, as well as their formal and informal rules and regulations, while community factors include "relationships among organizations, institutions, and informal networks within defined boundaries" (McLeroy et al., 1988, p. 355). Public policy factors are laws, policies, and regulations at the local, state, and national levels (McLeroy et al., 1988).

Propositions of the Social Ecological Model

The five levels within the social ecological model are illustrated in Figure 3. Each subsequent level is inclusive of the preceding levels. This model serves as a reminder that individual knowledge is not sufficient for behavior change. Establishing a supportive environment is also important in efforts to alter behavior. A tobacco-free school policy enables each school to create a supportive environment for students to not use tobacco.

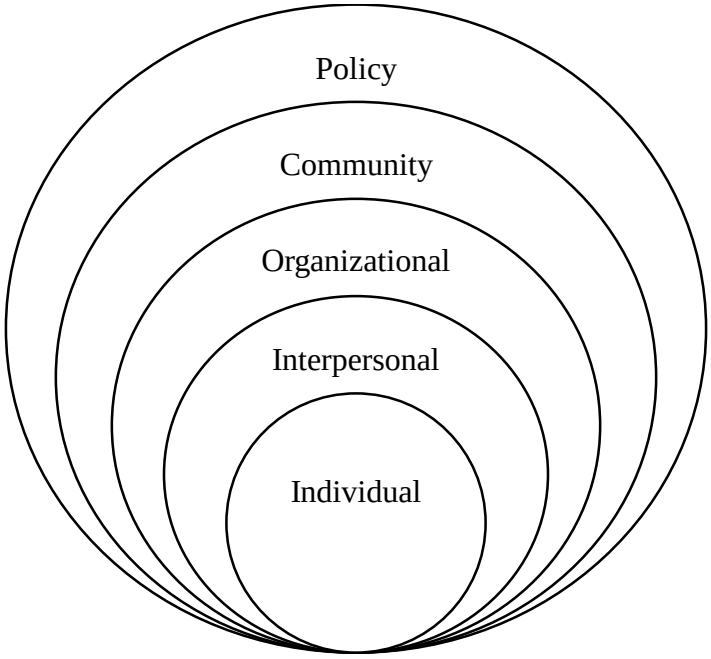

Figure 3. The Social Ecological Model

Applications of the Social Ecological Model in Other Studies

The adoption of a social ecological approach is predominant in studies that involved interventions focused on individual and interpersonal characteristics, not institutional, community, or policy factors, concentrated on certain topics, especially nutrition and physical activity, and occurred in particular settings, such as a middle school or high school (Golden & Earp, 2012). “Ecological frameworks in which the school context is a central dimension associated with student smoking” have guided comprehensive approaches to tobacco control

interventions (Sabiston et al., 2009, p. 1375). In order to reveal the causes of youth smoking, a social ecological model which incorporates multiple social systems seems more appropriate than single-system models (Wen et al., 2009). The understanding of individual smoking behavior in adolescence requires knowledge of the social contexts at the peer level, family level, school level, neighborhood level, and state level. According to Wen et al. (2009), the most significant contextual factors include the behaviors of influential others and the relational assets or deficits in the family or among peers. Influential others include peers and household members. Closeness with parents is considered to be a relational asset in the family, while frequently spending time with friends is a relational asset among peers (Wen et al., 2009). Sabiston et al. (2009) examined student smoking behavior on an individual level consisting of perceptions of tobacco context, school connectedness, and family and friends who are smokers, as well as on a school level consisting of policy intent, policy implementation, and policy enforcement. The findings of the study provided evidence of an association between a student's tobacco use and his or her normative beliefs related to tobacco use by family members and peers, and they also suggested the importance of school tobacco policies as part of a comprehensive approach to adolescent tobacco use (Sabiston et al., 2009).

Theoretical Framework

The reasoned action approach and the social ecological model can be combined as complementary theories to create a single theoretical framework for understanding youth tobacco use for this study, as shown in Figure 4. The reasoned action approach offers insight on the predictors of a young individual's decision to use tobacco, while the social ecological model offers reasoning for the inclusion of multiple facets of an individual's physical and social environments, as well as various levels of influence, into this study. It does not focus solely on

environmental, biological, or behavioral determinants of youth tobacco use. The social ecological model explains the multilevel nature of tobacco control efforts among youth and provides a theoretical foundation for intervention strategies in the school environment.

The background factors, behavioral beliefs, and control beliefs in the reasoned action approach are found at the individual level of the social ecological model. The normative beliefs in the reasoned action approach are situated at the interpersonal level of the social ecological model. Actual behavioral control in the reasoned action approach is located at the policy level of the social ecological model.

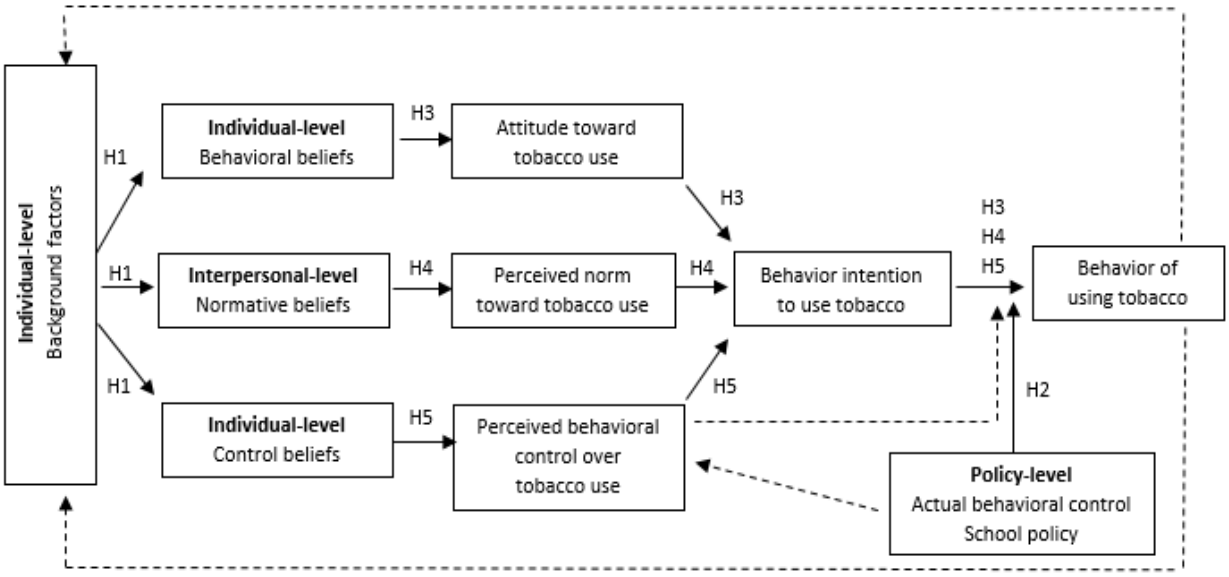

Figure 4. Theoretical Framework

Development of Hypotheses

The purpose of this study was to determine the impact of policy-level factors, as well as individual-level factors and interpersonal-level factors, on youth tobacco use. Therefore, the hypotheses generated for this study pertain to the three aforementioned levels as they are related to youth tobacco use as outlined above.

Based on the complementary theories of the reasoned action approach and the social ecological model, this examination of behavioral beliefs about the consequences of youth tobacco use, normative beliefs about the thoughts and actions of the important people in a student's life, control beliefs about tobacco-free school policies, and actual behavioral control of a comprehensive tobacco-free school policy aims to answer five research questions. These research questions relate to the extent to which the individual-level factors, interpersonal-level factors, and policy-level factors impact the youth tobacco use behaviors of cigarette use and cigar use. These types of factors may be associated with the outcome of youth tobacco use to varying extents. The specific research questions and hypotheses derived from the theoretical framework include:

RQ1. What is the impact of background factors on youth tobacco use among Florida high school students?

Background factors are located at the individual level of the social ecological model (McLeroy et al., 1988). Background factors consist of individual factors (e.g., mood and emotion), social factors (e.g., demographic characteristics), and information factors (e.g., media exposure and knowledge). According to the reasoned action approach, these three types of factors impact each individual's experiences, which may lead to different behavioral beliefs, normative beliefs, and control beliefs (Fishbein & Ajzen, 2010). Ultimately, these beliefs influence behavior intentions to use tobacco and behaviors of using tobacco (Fishbein & Ajzen, 2010). According to the 2012 Surgeon General's report (CDC, 2012), high school students with the following background factors are more likely to use tobacco: male (SAMHSA, 2013), higher grade in school (SAMHSA, 2013), identification as White/Non-Hispanic (Kann et al., 2014;

SAMHSA, 2013), negative moods (Acierno et al., 2000; Dierker et al., 2001; Kim et al., 2009; Martini et al., 2002; Patton et al., 1998), and less exposure to anti-tobacco messages (Bauer, Johnson, Hopkins, & Brooks, 2000; Niederdeppe, Farrelly, & Haviland, 2004; Sly, Heald, & Ray, 2001; Sly, Hopkins, Trapido, & Ray, 2001; Sly, Trapido, & Ray, 2002). Although research has concluded that school-based informational approaches to reducing tobacco use are usually not effective (CDC, 2012; U.S. DHHS, 1994), the reasoned action approach suggests that knowledge influences beliefs and behavior (Fishbein & Ajzen, 2010).

H1a. The male gender is positively associated with youth tobacco use among Florida high school students.

H1b. Higher grade levels are positively associated with youth tobacco use among Florida high school students.

H1c. Identification as White/Non-Hispanic is positively associated with youth tobacco use among Florida high school students.

H1d. Depressive symptoms are positively associated with youth tobacco use among Florida high school students.

H1e. Exposure to anti-tobacco media is negatively associated with youth tobacco use among Florida high school students.

H1f. Knowledge about tobacco use is negatively associated with youth tobacco use among Florida high school students.

RQ2. Do comprehensive tobacco-free school policies reduce youth tobacco use among Florida high school students?

Actual behavior control is located at the policy level of the social ecological model (McLeroy et al., 1988). According to the reasoned action approach, actual behavioral control includes barriers to the performance of a behavior (Fishbein & Ajzen, 2010). The presence of a tobacco-free school policy as an environmental constraint may prevent individuals from acting on their behavioral intentions to use tobacco and change his or her behavior of using tobacco.

H2. A comprehensive tobacco free-school policy does reduce youth tobacco use among Florida high school students. The most comprehensive tobacco-free school policies will lead to greater reductions in the behaviors than the least comprehensive tobacco-free school policies.

RQ3.What is the impact of behavioral beliefs on youth tobacco use among Florida high school students?

Behavioral beliefs are located at the individual level of the social ecological model (McLeroy et al., 1988). According to the reasoned action approach, behavioral beliefs about tobacco use determine an individual's attitude towards tobacco use based on his or her outcome evaluation, which in turn influences his or her behavior intention to use tobacco and his or her behavior of using tobacco (Fishbein & Ajzen, 2010).

H3a. Behavioral beliefs that smokers die earlier are negatively associated with youth tobacco use among Florida high school students.

H3b. Behavioral beliefs that smokers have more friends are positively associated with youth tobacco use among Florida high school students.

H3c. Behavioral beliefs that smokers look cool are positively associated with youth tobacco use among Florida high school students.

H3d. Behavioral beliefs that smoking relieves stress are positively associated with youth tobacco use among Florida high school students.

RQ4.What is the impact of normative beliefs on youth tobacco use among Florida high school students?

Normative beliefs are located at the interpersonal level of the social ecological model (McLeroy et al., 1988). According to the reasoned action approach, normative beliefs about tobacco use produce a perceived norm of tobacco use, which in turn influences an individual's behavior intention to use tobacco and his or her behavior of using tobacco (Fishbein & Ajzen, 2010). Students who hold affirmative normative beliefs towards tobacco use by the important people in their lives are more likely to continue their smoking behavior than those who do not have family members and friends who use tobacco.

H4a. Descriptive normative beliefs that a student's family members use tobacco themselves are positively associated with youth tobacco use among Florida high school students.

H4b. Descriptive normative beliefs that a student's peers use tobacco themselves are positively associated with youth tobacco use among Florida high school students.

RQ5.What is the impact of control beliefs on youth tobacco use among Florida high school students?

Control beliefs are located at the individual level of the social ecological model (McLeroy et al., 1988). According to the reasoned action approach, control beliefs about the inhibiting factor of a tobacco-free school policy lessens an individual's perceived behavioral control over tobacco use, which in turn influences his or her behavior intention to use tobacco

and his or her behavior of using tobacco (Fishbein & Ajzen, 2010). Students who have developed control beliefs about smoking behaviors being prohibited are less likely to use tobacco products than those who are not aware of such restrictions.

H5. Control beliefs that a tobacco-free school policy has been implemented are negatively associated with youth tobacco use among Florida high school students.

CHAPTER 4. RESEARCH METHODOLOGY

This section details the research methodology used in this study and describes the research design, sampling method, data collection, identification of the independent and dependent variables, measurement of the variables, and analytical methods.

Research Design

This study was a secondary data analysis that employed a pooled cross-sectional design. The available datasets were provided by the FDOH. A representative sample of Florida high school students was studied prior to and after the introduction of the intervention of public school districts' tobacco-free control policies. This type of research design allows for the examination of policy effects while controlling for individual-level, interpersonal-level, and policy-level factors associated with youth tobacco use. Pooled cross-sectional data collected prior to a policy change and also following a policy change enables the researcher to use regression analyses to disentangle the effects attributable to the policy change and determine the explanatory power of the independent variables. The pretest data was collected in the 2010 FYTS prior to the amendment to the Florida Clean Indoor Air Act, and the posttest data was collected afterwards in the 2014 FYTS. The four year period between the two surveys allowed the researcher to observe the effects of the policy over time.

Population and Sample Selection

The population of this study was youth attending public high schools in the state of Florida. These individuals are directly affected by the development and implementation of tobacco-free school policies. Students in all 67 public school districts in Florida were included in the sample. However, the FYTS was not administered to students in public high schools in Okeechobee County School District and Hardee County School District in 2010 and 2014,

respectively. Students from the four laboratory schools, the Florida School for the Deaf and Blind, the Florida Virtual School, and the Okeechobee Youth Development Center were not included in the sample.

Data from the FYTS, which is a statewide, school-based confidential survey of students in Florida's public middle schools and high schools in grades 6 through 12, was examined. The FYTS used a two-stage cluster probability sample selection process. First, a random sample of public middle schools and high schools within each public school district was selected. Second, a random sample of classrooms was chosen within each school, and all students in these classrooms were invited to participate in the FYTS. The sample size of the 2010 FYTS was 77,182 students. The number of high school students within the sample for 2010 was 37,797. The sample size of the 2014 FYTS was 69,923 students. The number of high school students within the sample for 2014 was 32,930. Cases with missing values for the dependent variable were deleted. Bennett (2001) stated that statistical analysis is likely to be biased if more than 10% of the data are missing. Since less than 10% of the data for each independent variable was missing, the missing values for these categorical variables were imputed with the mode.

At the high school level in 2010, the school participation rate was 98%, and the student participation rate was 76%. The overall participation rate was 74% (ICF Macro, 2010). At the high school level in 2014, the school participation rate was 98%, and the student participation rate was 79%. The overall participation rate was 78% (ICF International, 2014).

Data Collection

Florida Youth Tobacco Survey (FYTS)

The data from the 2010 FYTS and 2014 FYTS were used for the analysis. The years 2010 and 2014 were selected because county-level data was available, and it covered any

delayed impacts of the tobacco-free school policies that were implemented after the year 2011 compared to the 2012 FYTS.

The FYTS is a survey that tracks indicators of tobacco use and exposure to SHS among public middle school and high school students in Florida. It allows the Bureau of Tobacco Prevention and Control at the FDOH to monitor and evaluate tobacco use among youth. The first FYTS was administered in 1998. Since then, it has been conducted annually by the FDOH. County-level data have been collected in all even years since 2000 except 2004. The FYTS is now a part of the Florida Youth Survey (FYS), which also includes "the Youth Risk Behavior Survey (YRBS), the Middle School Health Behavior Survey (MSHBS), and the Florida Youth Substance Abuse Survey (FYSAS)" (Florida Department of Health [FDOH], n.d., Survey Guidelines section). Many agencies have supported the FYTS, including the Florida Department of Education, the Florida Department of Children and Families, the Florida Department of Juvenile Justice, school districts throughout the state, and the Office on Smoking and Health at the CDC (FDOH, n.d.). Results of the FYTS have been utilized in other public health studies (Barnett, Forrest, Porter, & Curbow, 2014; Bauer et al., 2000; Kennedy, Sullivan, Hendlin, Barnes, & Glatz, 2012; Saunders, 2011).

Comprehensiveness of a Tobacco-Free School Policy

Data on the comprehensiveness of each public school district's tobacco-free school policy was obtained from the Bureau of Tobacco Free Florida. County-level staff members from the 67 public school districts in Florida "self-reported the components of their tobacco-free school policy to the Bureau of Tobacco Free Florida as of January 1, 2014" (Terry & Zhang, 2016, p. 131). A random sample of 10% of the public school districts (n=7) were selected, and emails were sent to their offices to validate the data. The seven public school districts were

Indian River County School District, Nassau County School District, Palm Beach County School District, Pasco County School District, Santa Rosa County School District, Seminole County School District, and St. Johns County School District.

Measurement of Study Variables

The selection of study variables included in the analyses was guided by the theoretical framework. The types, definitions, attributes, and sources of the variables are outlined in Table 1.

Table 1. Variable Measurement Table

Variable	Type	Definition	Attributes	Sources
Cigarette use	Dependent variable	The use of cigarettes during the last 30 days by the student	For binary: 0=Nonsmoker; 1=Smoker For multinomial: 0=Nonsmoker; 1=Less than daily smoker; 2=Daily smoker	2010 FYTS Q13 2014 FYTS Q13
Cigar use	Dependent variable	The use of cigars during the last 30 days by the student	For binary: 0=Nonsmoker; 1=Smoker For multinomial: 0=Nonsmoker; 1=Less than daily smoker; 2=Daily smoker	2010 FYTS Q39 2014 FYTS Q39
Tobacco-free school policy level	Policy-level independent variable	The implementation of a tobacco-free school policy and its comprehensiveness	0=None; 1=Least comprehensive; 2=Less comprehensive; 3=More comprehensive; 4=Most comprehensive	Bureau of Tobacco Free Florida
Gender	Individual-level independent variable	The gender of the student	0=Female; 1=Male	2010 FYTS Q2 2014 FYTS Q2
Grade	Individual-level independent variable	The grade of the student	0=9th; 1=10th; 2=11th; 3=12th	2010 FYTS Q3 2014 FYTS Q3
Race/ethnicity	Individual-level independent variable	The race/ethnicity of the student	0=White/Non-Hispanic; 1=Black/Non-Hispanic; 2=Hispanic; 3=Other	2010 FYTS Q4/5 2014 FYTS Q4/5
Background factor – Depressive symptoms	Individual-level independent variable	The student felt so sad for two weeks during the past 12 months that he/she stopped doing usual activities	0=No; 1=Yes	2010 FYTS Q110 2014 FYTS Q113
Background factor – Anti-tobacco media exposure	Individual-level independent variable	The exposure (hearing or seeing) to anti-tobacco messages during the past 30 days	0=No; 1=Yes	2010 FYTS Q78 2010 FYTS Q78
Background factor – Knowledge	Individual-level independent variable	The teaching about tobacco use during the current school year	0=No; 1=Yes	2010 FYTS Q48 2014 FYTS Q54
Behavioral belief – Die earlier	Individual-level independent variable	The belief that smokers die earlier	0=No; 1=Yes	2010 FYTS Q65 2014 FYTS Q67
Behavioral belief – More friends	Individual-level independent variable	The belief that smokers have more friends	0=No; 1=Yes	2010 FYTS Q64 2014 FYTS Q66a
Behavioral belief – Looks cool	Individual-level independent variable	The belief that smoking makes you look cool	0=No; 1=Yes	2010 FYTS Q66 2014 FYTS Q68a
Behavioral belief – Relieves stress	Individual-level independent variable	The belief that smoking relieves stress	0=No; 1=Yes	2010 FYTS Q69 2014 FYTS Q71a
Control belief	Individual-level independent variable	The student's knowledge of a rule at school that prohibits smoking on school property	0=No; 1=Not sure; 2=Yes	2010 FYTS Q55 2014 FYTS Q58a
Family descriptive normative belief	Interpersonal-level independent variable	The use of cigarettes by an individual who lives in the student's household	0=No; 1=Yes	2010 FYTS Q90 2014 FYTS Q93a
Peer descriptive normative belief	Interpersonal-level independent variable	The use of cigarettes by a student's peers on school property	0=No; 1=Not sure; 2=Yes	2010 FYTS Q56 2014 FYTS Q59a

Dependent Variable

The individual-level dichotomous dependent variable was youth tobacco use. For the purpose of this study, the tobacco products of cigarettes and cigars comprised youth tobacco use. The frequency of these two behaviors was determined by the 2010 FYTS and 2014 FYTS. Question 13 asked: "During the past 30 days, on how many days did you smoke cigarettes?" Question 39 asked: "During the past 30 days, on how many days did you smoke cigars/cigarillos/little cigars?" The possible answer choices for both questions were: (1) 0 days, (2) 1 or 2 days, (3) 3 to 5 days, (4) 6 to 9 days, (5) 10 to 19 days, (6) 20 to 29 days, and (7) all 30 days. For binary logistic regression, no tobacco use behavior during the past 30 days was recoded to (0) "nonsmoker," and any tobacco use behavior during the past 30 days was recoded to (1) "smoker." To increase sensitivity of measurement, the dependent variable was treated in three categories for multinomial logistic regression. The data was recoded into three categories: no tobacco use behavior reported in the past 30 days was recoded to (0) "nonsmoker," some tobacco use behavior reported in the past 30 days was recorded to (1) "less than daily smoker," and tobacco use behavior each day in the past 30 days was recorded to (2) "daily smoker."

Policy-Level Independent Variable

The policy-level independent variable was actual behavioral control of a public school district's tobacco-free school policy. The components were coded 1 through 12. The public school districts were divided into four categories based on the comprehensiveness level of their tobacco-free school policies. The Bureau for Tobacco Free Florida classifies the four comprehensiveness levels from lowest to highest as having less than four components, four to eight components, nine to eleven components, or all 12 components. Actual behavioral control was recoded to (0) no tobacco-free school policy through (4) a comprehensive tobacco free

school policy. These policies did not exist when the 2010 FYTS was administered, so this variable was recoded as 0 in the 2010 data. The 12 components of a comprehensive tobacco-free school policy in Florida are the following:

> "1. Policy includes a statement of rationale for the policy and definitions of tobacco and tobacco use;
>
> 2. Tobacco is specifically named; not implied by prohibiting drugs;
>
> 3. All components of the policy are effective 24 hours a day; 365 days per year;
>
> 4. All school buildings, grounds, campuses, housing, property (including vehicles and buses) whether owned or leased are tobacco free at all times;
>
> 5. Students are prohibited from possessing and/or using tobacco products on school grounds, at school events, whether on or off district property;
>
> 6. School staff are prohibited from using tobacco products on school grounds, at school events, whether on or off district property;
>
> 7. Visitors are prohibited from using tobacco products on school grounds, at school events, whether on or off district property;
>
> 8. Wearing clothing or using other items that advertise or promote tobacco products is prohibited;
>
> 9. Tobacco advertising and acceptance of gifts, including curriculum, from tobacco companies is prohibited;
>
> 10. A plan to communicate the policy to all students, employees and visitors is outlined;
>
> 11. An enforcement plan for students, staff and visitors is outlined;
>
> 12. An enforcement plan for students and staff that provides cessation resources is outlined" (Tobacco Free Florida, 2012a).

Individual-Level Independent Variables

First, three individual-level independent variables related to demographic characteristics were included. In the 2010 FYTS and the 2014 FYTS, Question 2 asked about gender, Question 3 asked about grade, and Question 4 and Question 5 asked about race/ethnicity. Gender was recoded to (0) female and (1) male. Grade was recoded to (0) 9th grade, (1) 10th grade, (2) 11th grade, and (3) 12th grade. Race/ethnicity was recoded to (0) White/Non-Hispanic, (1) Black/Non-Hispanic, (2) Hispanic, and (3) other race/ethnicity.

Second, three individual-level independent variables related to the background factors of depressive symptoms, anti-tobacco media exposure, and knowledge were included. Question 110 in the 2010 FYTS and Question 113 in the 2014 FYTS asked about the individual factor of depressive symptoms: "During the past 12 months, did you ever feel so sad or hopeless almost every day for two or more weeks in a row that you stopped doing some usual activities?" A negative answer was recoded to (0) no, and an affirmative answer was recoded to (1) yes. Question 78 in the 2010 FYTS and 2014 FYTS asked about the information factor of anti-tobacco media exposure: "During the past 30 days, about how often have you heard anti-smoking messages on the radio or seen them on TV, on the internet, on billboards or outdoor signs, or in magazines and newspapers?" The possible answers choices were (1) 0 days, (2) 1 or 2 days, (3) 3 to 5 days, (4) 6 to 9 days, (5) 10 to 19 days, (6) 20 to 29 days, and (7) all 30 days. A negative answer of 0 days was recoded to (0) no, and an affirmative answer of 1 or more days was recoded to (1) yes. Question 48 in the 2010 FYTS and Question 54 in the 2014 FYTS asked about knowledge: "During this school year, were you taught in any of your classes about tobacco use?" A negative answer or an uncertain answer was recoded to (0) no, and an affirmative answer was recoded to (1) yes.

Third, four individual-level independent variables related to behavioral beliefs were included. Questions pertaining to the behavioral beliefs regarding whether smokers die earlier (Q65 and Q67), smokers have more friends (Q64 and Q66a), smoking makes you look cool (Q66 and Q68a), and smoking relieves stress (Q69 and Q71a) were asked in the 2010 FYTS and 2014 FYTS. A negative answer – probably no or definitely no – to a question about a behavioral belief was recoded to (0) no, and an affirmative answer – probably yes or definitely yes – was recoded to (1) yes.

Fourth, a student's control belief was an individual-level independent variable. In the 2010 FYTS, Question 55 asked about policy: "Is there a rule at your school that no one is allowed to smoke cigarettes in the school building or on the school yard?" In the 2014 FYTS, Question 58a asked about policy: "Is there a rule at school against smoking cigarettes on school property?" A negative answer was recoded to (0) no, an uncertain answer was recoded to (1) not sure, and an affirmative answer was recoded to (2) yes.

Interpersonal-Level Independent Variables

The interpersonal-level independent variables included the descriptive normative beliefs related to a student's family and peers. Question 90 in the 2010 FYTS and Question 93a in the 2014 FYTS asked about a descriptive normative belief related to a student's family: "Does anyone who lives in your house smoke cigarettes now?" In the 2010 FYTS, Question 56 asked about a descriptive normative belief related to a student's peers: "Have you ever seen students break that rule [that no one is allowed to smoke cigarettes in the school building or on the school yard]?" In the 2014 FYTS, Question 59a asked about a descriptive normative belief related to a student's peers: "In the past 12 months, have you seen students using cigarettes on school

property?" A negative answer was recoded to (0) no, an uncertain answer was recoded to (1) not sure, and an affirmative answer was recoded to (2) yes.

The injunctive normative belief about a student's family members could not be included as a variable in this study due to the available answer choices for the corresponding questions on the 2010 FYTS and 2014 FYTS.

Data Analysis

Using the IBM SPSS Statistics Premium GradPack 23 computer software, hierarchical binary logistic regression and hierarchical multinomial logistic regression were used to analyze the data (IBM Corp., 2015). This software includes the Complex Samples module and allows for the assignment of sample weights, which is important due to the two-stage cluster probability sampling methodology of the FYTS. County population weights and state population weights for middle school students and high school students were calculated separately for each year. The base weight was calculated by combining the following weights: the inverse of the probability of selection of the school and level, adjustment for school nonresponse, sampling interval, adjustment for class nonresponse, and adjustment to class size (ICF Macro, 2010; ICF International, 2014).

Next, there was a process to calculate county population weights (ICF Macro, 2010; ICF International, 2014). At the county level, the student weights were classified into cells defined as a combination of grade, gender and race. County-level population totals for the same grade, gender, and race cells were obtained from the Department of Education. The student weights were post-stratified to the county-level population totals with a minimum adjustment of 2/3 and a maximum adjustment of 3/2. The adjusted weight was trimmed to equal twice the median weight if it was greater than twice the median weight. Then, the trimmed weights were post-stratified

again to the county-level population totals for grade only. No minimum and maximum adjustments were applied at this level of post-stratification (ICF Macro, 2010; ICF International, 2014).

An analysis plan was created to carry out procedures in the IBM SPSS Statistics Premium GradPack 23 computer software. This step allowed the researcher to select public school districts as the stratification variable, select schools as the cluster variable, and define sample weights. The county population weights available in the 2010 FYTS and 2014 FYTS were selected as the sample weights.

Regression analysis is defined as a statistical process that is used "to understand, as far as possible with the available data, how the conditional distribution of the response *y* varies across subpopulations determined by the possible values of the predictor or predictors" (Cook & Weisberg, 1999, p. 27). This method is useful for researchers to determine how much of the variance in the dependent variable is contributed to each of the independent variables. Comparing the standardized beta value of each independent variable allows the researcher to determine the relative importance of each independent variable. Statistics derived from regression analyses are generalizable when there is a large sample size.

In particular, regression was utilized as the method to predict the probability that a student smokes cigarettes and cigars based on the given independent variables. Since students and their individual-level factors at level 1 and interpersonal-level factors at level 1 are nested within districts and their policy-level factors at level 2, hierarchical models examined the data with group structure to determine how the factors at each level were associated with tobacco use behaviors. Two types of hierarchical logistic regression models – binary and multinomial – were used to examine the behaviors of cigarette smoking and cigar smoking. Hierarchical binary

logistic regression was used to examine tobacco use of high school students when the dependent variables were dichotomous (i.e., smoker or nonsmoker), and hierarchical multinomial logistic regression was used to examine it when the dependent variables included three categories (i.e., daily smoker, less than daily smoker, or nonsmoker). There were two models for each behavior, so overall, there were four models in this study. Multinomial logistic regression is conducted when the dependent variable is nominal with more than two levels. Thus, this type of model is an extension of logistic regression, which only analyzes dichotomous dependent variables.

There are certain assumptions for logistic regression. First, the dependent variable is dichotomous in binary logistic regression and categorical in multinomial logistic regression. Second, there are one or more independent variables, which may be continuous or categorical in binary logistic regression and continuous or dichotomous in multinomial logistic regression. Third, the dependent variable should have mutually exclusive and exhaustive categories. Fourth, there must be a linear relationship between any continuous independent variables and the logit transformation of the dependent variable in binary logistic regression. Researchers should be aware of the possibility of multicollinearity in a dataset. Multicollinearity exists when two or more independent variables are highly correlated with each other. This high correlation could lead to problems understanding which variable contributes to the explanation of the dependent variable. Neither binary logistic regression nor multinomial logistic regression makes any assumptions in regard to normality, linearity, or homogeneity of variance for the included independent variables.

In this study, the same equation was used for hierarchical binary logistic regression and hierarchical multinomial logistic regression, but there were differences in the dependent variables. In the binary models, the dependent variable of youth tobacco use was dichotomous –

"nonsmoker" or "smoker." In the multinomial models, a number of dichotomies were compared, and the dependent variable of youth tobacco use was treated in three categories – "nonsmoker," "less than daily smoker," or "daily smoker." The equation for the hierarchical logistic regression models was:

$$\text{Logit}(\pi_{ij})=\alpha + \beta Policy_i + \gamma_j + \beta_k X_{ijk}$$

Where $\gamma_j \sim i.i.d.N\left(0, \sigma_g^2\right)$, $\pi_{ij}$was the expected probability of tobacco use for the $_j$th student of the $_i$th public school district conditional on the independent variables and the random effect.

α = Constant

β = Regression coefficient

X_k included the following independent variables:

X_1 = Gender

X_2 = Grade

X_3 = Race/ethnicity

X_4 = Depressive symptoms

X_5 = Anti-tobacco media exposure

X_6 = Knowledge

X_7 = Behavioral belief – Die earlier

X_8 = Behavioral belief – More friends

X_9 = Behavioral belief – Looks cool

X_{10} = Behavioral belief – Relieves stress

X_{11} = Control belief

X_{12} = Family descriptive normative belief

X_{13} = Peer descriptive normative belief

The associations between youth tobacco use and students' individual-level factors, interpersonal-level factors, and policy-level factors were investigated through the statistical significances, odds ratios of the predictors, and goodness of fit measures. A p-value for a regression coefficient estimate less than 0.05 indicated statistical significance of an independent variable. Odds ratios were used to compare the relative odds of youth tobacco use, given exposure to a particular independent variable. An odds ratio of one meant that exposure to the independent variable did not affect the odds of youth tobacco use. An odds ratio greater than one meant that exposure to the independent variable was associated with higher odds of youth tobacco use. An odds ratio less than one meant that exposure to the independent variable was associated with lower odds of youth tobacco use. In the model summary, pseudo R-square values were considered as measures of goodness of fit. The pseudo R-square value indicated the amount of variation explained by the model with the given independent variables. Given alpha, power, and effect size, an a priori power analysis was conducted to compute the minimum sample size.

CHAPTER 5. RESULTS

In the following section, five questions, listed below, are answered through hypothesis testing and the use of descriptive statistics, binary logistic regression, and multinomial logistic regression. Descriptive statistics related to cigarette use and cigar use, as well as demographic characteristics, background factors, behavioral beliefs, normative beliefs, control beliefs, and tobacco-free school policies, are presented. Binary and multinomial logistic regression analyses answered the questions about the impact of the risk factors on youth tobacco use. The conclusions of hypothesis testing are summarized and explained in this section.

The purpose of this study was to answer the following five research questions:

1. What is the impact of background factors on youth tobacco use among Florida high school students?
2. Do tobacco-free school policies reduce youth tobacco use among Florida high school students?
3. What is the impact of behavioral beliefs on youth tobacco use among Florida high school students?
4. What is the impact of normative beliefs on youth tobacco use among Florida high school students?
5. What is the impact of control beliefs on youth tobacco use among Florida high school students?

Results of Descriptive Statistics

Descriptive Statistics of Youth Tobacco Use Behaviors

In this study, tobacco use behaviors included cigarette use and cigar use. The 2010 FYTS and 2014 FYTS asked the participant on how many days during the past 30 days did he or she

smoke cigarettes in Question 13 or cigars/cigarillos/little cigars in Question 39. Overall, the prevalence of cigarette use in the state of Florida was 14.5% and 8.7% in 2010 and 2014 based on the surveys, respectively. Overall, the prevalence of cigar use in the state of Florida was 14.4% and 9.1% in 2010 and 2014, respectively. In 2010, the county-level prevalence rates of cigarette use ranged from 9.6% to 43.6%. In 2014, the county-level prevalence rates of cigarette use ranged from 3.7% to 31.4%. In 2010, the county-level prevalence rates of cigar use ranged from 9.3% to 28.4%. In 2014, the county-level prevalence rates of cigar use ranged from 5.3% to 24.3%. While the overall prevalence of cigarette use and cigar use declined, the prevalence of cigarette use increased or did not change in five public school districts, and the prevalence of cigar use increased or did not change in seven public school districts.

Table 2 shows the prevalence rates of cigarette use and cigar use in each Florida public school district when the outcomes were dichotomous – "nonsmoker" and "smoker." The unweighted count and the weighted percentage are given. The weighted percentage is the prevalence rate of the tobacco use behavior within the public school district. Due to nonparticipation in the FYTS, the prevalence rates were not available for Okeechobee County Public School District in 2010 and Hardee County Public School District in 2014. No missing values were included in these descriptive statistics. For Question 13 about cigarettes, there were 185 missing responses (0.6%) in the 2010 FYTS and 325 missing responses (1.0%) in the 2014 FYTS. There was a total of 510 missing responses (0.7%) in both years. For Question 39 about cigars/cigarillos/little cigars, there were 563 missing responses (1.7%) in the 2010 FYTS and 697 missing responses (2.0%) in the 2014 FYTS. There was a total of 1,260 missing responses (1.8%) in both years.

Table 2. Prevalence Rates of Tobacco Use in Florida Public School Districts

PSD	2010 Cigarette Use		2014 Cigarette Use		2010 Cigar Use		2014 Cigar Use	
	Count	Weighted %	Count	Weighted %	Count	Weighted %	Count	Weighted %
Alachua	114	12.1%	50	6.4%	165	17.9%	73	10.4%
Baker	114	24.3%	57	17.0%	78	15.5%	51	15.5%
Bay	129	16.8%	78	13.0%	128	17.5%	68	11.7%
Bradford	26	15.7%	28	12.1%	37	21.3%	24	11.9%
Brevard	116	14.1%	64	9.8%	135	16.0%	70	11.2%
Broward	102	9.6%	58	5.0%	98	9.6%	66	5.8%
Calhoun	48	18.1%	25	11.7%	55	22.1%	22	10.5%
Charlotte	99	21.1%	74	16.9%	76	17.0%	59	13.8%
Citrus	137	23.9%	61	14.1%	116	20.4%	47	10.7%
Clay	146	20.3%	62	12.6%	135	18.6%	74	14.7%
Collier	105	15.8%	57	9.2%	96	15.0%	56	9.2%
Columbia	86	21.9%	45	14.6%	78	18.7%	31	10.6%
Miami-Dade	136	10.1%	64	6.7%	128	9.3%	49	5.3%
DeSoto	65	15.1%	49	14.9%	69	16.8%	45	13.7%
Dixie	48	27.6%	35	18.0%	28	15.5%	23	11.7%
Duval	187	15.0%	108	8.4%	230	19.1%	127	10.9%
Escambia	130	15.4%	61	9.3%	116	14.1%	65	10.1%
Flagler	59	15.6%	69	13.4%	63	17.2%	60	11.7%
Franklin	24	35.9%	14	22.8%	19	28.4%	16	23.4%
Gadsden	38	11.6%	42	13.6%	52	16.3%	58	18.9%
Gilchrist	65	27.0%	41	17.2%	40	14.4%	22	9.9%
Glades	19	20.6%	17	31.4%	21	22.7%	13	24.3%
Gulf	62	27.2%	44	19.8%	62	27.2%	27	12.5%
Hamilton	34	24.3%	16	10.4%	29	20.8%	11	7.7%
Hardee	92	21.1%	-	-	76	16.7%	-	-
Hendry	62	16.9%	46	12.0%	69	18.0%	42	12.0%
Hernando	149	21.1%	70	13.6%	142	19.6%	62	12.7%
Highlands	127	20.4%	55	13.2%	105	17.3%	58	14.7%
Hillsborough	140	14.1%	88	9.0%	162	16.8%	106	11.0%
Holmes	77	22.9%	60	19.7%	53	16.4%	46	15.4%
Indian River	63	15.4%	61	10.4%	62	15.3%	68	11.8%
Jackson	107	22.1%	68	18.1%	88	18.4%	50	12.9%
Jefferson	15	20.2%	2	3.7%	19	26.2%	6	10.9%
Lafayette	9	12.6%	13	25.7%	8	9.6%	9	21.4%
Lake	113	17.1%	91	13.3%	111	16.8%	85	12.7%
Lee	119	16.1%	46	8.7%	120	16.0%	52	10.2%
Leon	157	17.8%	73	8.2%	145	16.9%	95	11.5%
Levy	102	21.5%	62	17.3%	78	15.8%	49	15.0%
Liberty	5	43.6%	19	14.2%	5	26.3%	12	9.3%
Madison	57	21.3%	40	22.6%	49	19.6%	29	17.2%
Manatee	150	16.0%	33	7.3%	157	16.8%	42	9.6%
Marion	113	15.7%	52	9.8%	114	15.8%	48	9.6%
Martin	91	16.9%	32	8.1%	78	14.6%	46	13.8%
Monroe	115	23.1%	49	10.5%	105	21.3%	52	11.7%

PSD	2010 Cigarette Use		2014 Cigarette Use		2010 Cigar Use		2014 Cigar Use	
	Count	Weighted %	Count	Weighted %	Count	Weighted %	Count	Weighted %
Nassau	54	17.9%	45	9.9%	54	18.1%	53	12.4%
Okaloosa	166	18.2%	35	7.6%	147	16.6%	41	9.2%
Okeechobee	-	-	70	12.1%	-	-	79	13.8%
Orange	131	12.0%	53	5.5%	155	13.6%	57	6.1%
Osceola	104	11.9%	50	7.7%	105	11.9%	44	6.4%
Palm Beach	154	15.3%	88	8.4%	115	11.7%	100	10.0%
Pasco	152	18.1%	46	7.7%	160	18.6%	63	10.7%
Pinellas	69	12.5%	131	8.9%	63	13.3%	116	8.5%
Polk	159	18.3%	96	11.8%	155	17.9%	88	11.3%
Putnam	96	17.6%	65	16.2%	63	12.4%	49	13.0%
Santa Rosa	130	16.8%	59	8.6%	128	17.1%	47	6.8%
Sarasota	96	14.7%	50	10.2%	85	13.9%	45	9.4%
Seminole	93	17.8%	58	11.4%	70	14.0%	42	9.0%
Saint Johns	131	25.1%	100	16.5%	107	20.9%	86	13.6%
Saint Lucie	98	11.6%	44	7.6%	122	15.0%	52	9.0%
Sumter	114	20.4%	44	11.0%	95	16.9%	50	13.1%
Suwannee	89	21.3%	40	13.1%	63	15.5%	33	11.2%
Taylor	36	24.9%	31	12.3%	25	16.9%	32	12.8%
Union	42	19.6%	39	19.6%	28	14.1%	29	14.7%
Volusia	187	16.6%	44	8.4%	205	18.2%	51	9.8%
Wakulla	99	23.6%	50	16.0%	81	19.2%	43	14.0%
Walton	98	20.1%	65	15.3%	72	14.7%	44	10.5%
Washington	42	19.9%	65	23.5%	31	16.3%	57	21.0%
All	6292	14.5%	3547	8.7%	5929	14.4%	3415	9.1%

Table 3 and Table 4 show the frequencies of the categories representing all of the attributes of categorical independent variables, including grade, gender, race/ethnicity, depressive symptoms, anti-tobacco media exposure, knowledge, the four behavioral beliefs, the control belief, and the three normative beliefs. The unweighted count and the weighted percentage are given for each possible category – "nonsmoker," "less than daily smoker," and "daily smoker" – of cigarette use in Table 3 and cigar use in Table 4. Participants who did not answer Question 13 or Question 39 are listed under the "Not reported" columns of the tables.

Table 3. Frequency Table of Independent Variables for Cigarette Use Categories

Variables	Nonsmoker	Less than daily smoker	Daily smoker	Not reported	Total
Grade					
9th	19481 (29.1%)	1896 (24.2%)	767 (25.5%)	186 (28.8%)	22330 (28.6%)
10th	16041 (25.5%)	1766 (23.3%)	528 (17.8%)	131 (29.3%)	18466 (25.1%)
11th	13921 (24.1%)	1786 (25.5%)	653 (23.6%)	108 (20.4%)	16468 (24.2%)
12th	10935 (21.3%)	1638 (27.0%)	805 (33.1%)	85 (21.6%)	13463 (22.2%)
Gender					

Variables	Nonsmoker	Less than daily smoker	Daily smoker	Not reported	Total
Female	31318 (50.5%)	3316 (46.9%)	1228 (43.5%)	213 (39.3%)	36075 (49.9%)
Male	29060 (49.5%)	3770 (53.1%)	1525 (56.5%)	297 (60.7%)	34652 (50.1%)
Race/Ethnicity					
White/Non-Hispanic	31341 (41.5%)	4460 (55.7%)	1628 (55.3%)	220 (35.1%)	37649 (43.0%)
Black/Non-Hispanic	10846 (23.2%)	632 (9.3%)	209 (9.9%)	127 (30.5%)	11814 (21.7%)
Hispanic	13301 (28.2%)	1391 (27.3%)	618 (25.0%)	112 (22.9%)	15422 (28.0%)
Other Race/Ethnicity	4890 (7.1%)	603 (7.7%)	298 (9.8%)	51 (11.6%)	5842 (7.2%)
Depressive symptoms					
No	47510 (78.5%)	4584 (64.4%)	1609 (58.0%)	431 (84.1%)	54134 (76.8%)
Yes	12868 (21.5%)	2502 (35.6%)	1144 (42.0%)	79 (15.9%)	16593 (23.2%)
Anti-tobacco media exposure					
No	18203 (30.6%)	1917 (27.8%)	968 (36.8%)	335 (65.9%)	21423 (30.8%)
Yes	42175 (69.4%)	5169 (72.2%)	1785 (63.2%)	175 (34.1%)	49304 (69.2%)
Knowledge					
No	41808 (71.2%)	4927 (69.3%)	2005 (73.6%)	428 (83.3%)	49168 (71.2%)
Yes	18570 (28.8%)	2159 (30.7%)	748 (26.4%)	82 (16.7%)	21559 (28.8%)
Behavioral belief – Die earlier					
No	6282 (10.5%)	1430 (19.4%)	925 (35.7%)	49 (9.0%)	8686 (12.0%)
Yes	54096 (89.5%)	5656 (80.6%)	1828 (64.3%)	461 (91.0%)	62041 (88.0%)
Behavioral belief – More friends					
No	47850 (77.9%)	4602 (64.3%)	1359 (49.5%)	425 (83.8%)	54236 (76.0%)
Yes	12528 (22.1%)	2484 (35.7%)	1394 (50.5%)	85 (16.2%)	16491 (24.0%)
Behavioral belief – Looks cool					
No	53856 (88.3%)	5261 (74.8%)	1690 (58.3%)	466 (91.6%)	61273 (86.3%)
Yes	6522 (11.7%)	1825 (25.2%)	1063 (41.7%)	44 (8.4%)	9454 (13.7%)
Behavioral belief–Relieves stress					
No	22365 (36.7%)	974 (13.7%)	271 (11.4%)	105 (22.5%)	23715 (33.9%)
Yes	38013 (63.3%)	6112 (86.3%)	2482 (88.6%)	405 (77.5%)	47012 (66.1%)
Control belief					
No	5468 (10.2%)	754 (11.1%)	542 (20.2%)	43 (9.2%)	6807 (10.6%)
Not sure	10346 (19.7%)	743 (11.9%)	296 (11.6%)	54 (11.2%)	11439 (18.7%)
Yes	44564 (70.1%)	5589 (77.1%)	1915 (68.3%)	413 (79.6%)	52481 (70.7%)
Normative belief – Family					
No	43109 (74.3%)	3637 (53.6%)	997 (38.5%)	412 (82.6%)	48155 (71.6%)
Yes	17269 (25.7%)	3449 (46.4%)	1756 (61.5%)	98 (17.4%)	22572 (28.4%)
Normative belief – Peers					
No	25238 (42.5%)	1947 (26.0%)	645 (24.5%)	265 (49.2%)	28095 (40.6%)
Not sure	8855 (15.3%)	799 (11.6%)	397 (14.4%)	56 (12.6%)	10107 (14.9%)
Yes	26285 (42.2%)	4340 (62.4%)	1711 (61.2%)	189 (38.2%)	32525 (44.5%)

Table 4. Frequency Table of Independent Variables for Cigar Use Categories

Variables	Nonsmoker	Less than daily smoker	Daily smoker	Not reported	Total
Grade					
9th	19431 (29.1%)	1990 (22.3%)	463 (33.0%)	446 (33.1%)	22330 (28.6%)
10th	16031 (25.6%)	1939 (22.6%)	193 (15.4%)	303 (22.3%)	18466 (25.1%)
11th	13828 (24.0%)	2110 (26.8%)	252 (20.8%)	278 (22.1%)	16468 (24.2%)
12th	10833 (21.3%)	2054 (28.3%)	343 (30.8%)	233 (22.5%)	13463 (22.2%)
Gender					
Female	31788 (51.5%)	3431 (41.6%)	392 (30.4%)	464 (36.0%)	36075 (49.9%)
Male	28335 (48.5%)	4662 (58.4%)	859 (69.6%)	796 (64.0%)	34652 (50.1%)
Race/Ethnicity					
White/Non-Hispanic	32188 (42.6%)	4540 (50.5%)	428 (30.8%)	493 (31.8%)	37649 (43.0%)
Black/Non-Hispanic	9964 (22.0%)	1294 (17.9%)	227 (22.7%)	329 (29.9%)	11814 (21.7%)
Hispanic	13134 (28.3%)	1565 (24.3%)	417 (33.3%)	306 (28.6%)	15422 (28.0%)
Other Race/Ethnicity	4837 (7.1%)	694 (7.3%)	179 (13.2%)	132 (9.8%)	5842 (7.2%)
Depressive symptoms					
No	46810 (77.9%)	5533 (68.0%)	683 (55.4%)	1108 (88.3%)	54134 (76.8%)
Yes	13313 (22.1%)	2560 (32.0%)	568 (44.6%)	152 (11.7%)	16593 (23.2%)
Anti-tobacco media exposure					
No	17868 (30.1%)	2069 (26.4%)	522 (42.0%)	964 (78.4%)	21423 (30.8%)
Yes	42255 (69.9%)	6024 (73.6%)	729 (58.0%)	296 (21.6%)	49304 (69.2%)
Knowledge					
No	41455 (70.9%)	5696 (70.7%)	909 (72.6%)	1108 (89.8%)	49168 (71.2%)
Yes	18668 (29.1%)	2397 (29.3%)	342 (27.4%)	152 (10.2%)	21559 (28.8%)
Behavioral belief – Die earlier					
No	6441 (10.7%)	1563 (18.4%)	590 (48.6%)	92 (8.3%)	8686 (12.0%)
Yes	53682 (89.3%)	6530 (81.6%)	661 (51.4%)	1168 (91.7%)	62041 (88.0%)

Variables	Nonsmoker	Less than daily smoker	Daily smoker	Not reported	Total
Behavioral belief - More friends					
No	47333 (77.6%)	5350 (66.0%)	430 (35.1%)	1123 (88.7%)	54236 (76.0%)
Yes	12790 (22.4%)	2743 (34.0%)	821 (64.9%)	137 (11.3%)	16491 (24.0%)
Behavioral belief – Looks cool					
No	53380 (88.2%)	6181 (75.6%)	531 (42.2%)	1181 (93.4%)	61273 (86.3%)
Yes	6743 (11.8%)	1912 (24.4%)	720 (57.8%)	79 (6.6%)	9454 (13.7%)
Behavioral belief–Relieves stress					
No	22089 (36.7%)	1296 (16.1%)	165 (15.5%)	165 (14.5%)	23715 (33.9%)
Yes	38034 (63.3%)	6797 (83.9%)	1086 (84.5%)	1095 (85.5%)	47012 (66.1%)
Control belief					
No	5479 (10.3%)	866 (11.0%)	401 (32.4%)	61 (4.9%)	6807 (10.6%)
Not sure	10279 (19.8%)	866 (11.9%)	185 (16.1%)	109 (9.1%)	11439 (18.7%)
Yes	44365 (70.0%)	6361 (77.1%)	665 (51.5%)	1090 (86.0%)	52481 (70.7%)
Normative belief – Family					
No	42180 (73.5%)	4374 (56.3%)	504 (40.6%)	1097 (88.7%)	48155 (71.6%)
Yes	17943 (26.5%)	3719 (43.7%)	747 (59.4%)	163 (11.3%)	22572 (28.4%)
Normative belief – Peers					
No	25016 (42.4%)	2188 (26.7%)	238 (19.5%)	653 (50.2%)	28095 (40.6%)
Not sure	8834 (15.3%)	918 (12.1%)	274 (23.3%)	81 (7.4%)	10107 (14.9%)
Yes	26273 (42.4%)	4987 (61.2%)	739 (57.2%)	526 (42.4%)	32525 (44.5%)

Table 5 shows the components found in the tobacco-free school policy of each public school district in Florida. A 1 represents the inclusion of a component, while a 0 represents the exclusion of a component. The percentage of public school districts that have included each component is also shown. The 12 components of a comprehensive tobacco-free school policy in Florida are the following:

"1. Policy includes a statement of rationale for the policy and definitions of tobacco and tobacco use;

2. Tobacco is specifically named; not implied by prohibiting drugs;

3. All components of the policy are effective 24 hours a day; 365 days per year;

4. All school buildings, grounds, campuses, housing, property (including vehicles and buses) whether owned or leased are tobacco free at all times;

5. Students are prohibited from possessing and/or using tobacco products on school grounds, at school events, whether on or off district property;

6. School staff are prohibited from using tobacco products on school grounds, at school events, whether on or off district property;

7. Visitors are prohibited from using tobacco products on school grounds, at school events, whether on or off district property;

8. Wearing clothing or using other items that advertise or promote tobacco products is prohibited;

9. Tobacco advertising and acceptance of gifts, including curriculum, from tobacco companies is prohibited;

10. A plan to communicate the policy to all students, employees and visitors is outlined;

11. An enforcement plan for students, staff and visitors is outlined;

12. An enforcement plan for students and staff that provides cessation resources is outlined" (Tobacco Free Florida, 2012a).

Staff self-reported these components as of January 1, 2014 to the Bureau of Tobacco-Free Florida. These data were validated by the researcher through e-mails to a 10% random sample of public school districts (n=7) including Indian River County School District, Nassau County School District, Palm Beach County School District, Pasco County School District, Santa Rosa County School District, Seminole County School District, and St. Johns County School District. Six public school districts had a tobacco-free school policy categorized as Level 1 in terms of comprehensiveness with less than four components. Eleven public school districts had a tobacco-free school policy categorized as Level 2 with four to eight components. Twenty public school districts had a tobacco-free school policy categorized as Level 3 with nine to eleven components. Thirty public school districts had a tobacco-free school policy categorized as Level 4 with all 12 components.

Table 5. Tobacco-Free School Policy Components by Public School Districts

	Policy Components												
PSD	1	2	3	4	5	6	7	8	9	10	11	12	Level
Alachua	1	1	1	1	1	1	1	1	1	1	1	1	4
Baker	1	1	1	1	1	1	1	1	1	1	1	1	4
Bay	1	1	1	1	1	1	1	1	1	1	1	0	3

	Policy Components												
PSD	1	2	3	4	5	6	7	8	9	10	11	12	Level
Bradford	1	1	1	1	1	1	1	1	1	1	1	1	4
Brevard	1	1	0	1	0	0	1	1	0	1	1	0	2
Broward	0	1	0	0	0	0	0	0	0	1	0	0	1
Calhoun	1	1	1	1	1	1	1	1	1	1	1	1	4
Charlotte	1	1	1	1	1	1	1	1	0	0	1	0	3
Citrus	1	1	1	1	1	1	1	1	1	1	1	1	4
Clay	1	1	1	1	1	1	1	1	1	1	1	0	3
Collier	1	1	1	1	1	1	1	1	0	1	1	1	3
Columbia	1	1	1	1	1	1	1	1	1	1	1	1	4
Miami-Dade	1	1	1	1	1	1	1	0	1	1	1	0	3
DeSoto	1	1	1	1	1	1	1	1	1	1	1	1	4
Dixie	1	1	1	1	1	1	1	1	0	0	1	0	3
Duval	1	1	1	1	1	1	1	1	1	1	1	1	4
Escambia	0	0	0	0	0	0	0	1	0	1	0	0	1
Flagler	1	1	1	1	1	1	1	1	1	1	1	1	4
Franklin	1	1	0	1	1	1	1	1	0	0	0	0	2
Gadsden	1	1	1	1	1	1	1	1	1	1	1	1	4
Gilchrist	1	1	1	1	1	1	1	1	1	1	1	1	4
Glades	1	1	1	1	1	1	1	1	1	1	0	0	3
Gulf	0	1	1	1	1	0	0	0	0	0	0	0	2
Hamilton	1	1	1	1	1	1	1	1	1	1	1	1	4
Hardee	1	1	1	1	1	1	1	1	1	1	1	1	4
Hendry	0	1	1	1	1	1	1	1	0	1	0	0	2
Hernando	1	1	0	1	0	0	0	0	0	1	0	0	2
Highlands	1	1	1	1	1	1	1	1	1	1	1	0	3
Hillsborough	1	0	0	1	0	0	1	1	1	0	1	0	2
Holmes	1	1	1	1	1	0	0	0	0	0	0	0	2
Indian River	1	1	1	1	1	1	1	1	1	1	1	1	4
Jackson	0	0	0	0	1	0	0	0	0	1	0	0	1
Jefferson	1	1	1	1	1	1	1	1	1	0	0	1	3
Lafayette	1	1	1	1	1	1	1	1	1	1	1	1	4
Lake	1	1	1	1	1	1	1	1	1	1	1	1	4
Lee	1	1	1	1	1	1	1	1	0	0	0	0	2
Leon	1	1	1	1	1	1	1	0	1	1	0	0	3
Levy	1	1	1	1	1	1	1	1	1	1	1	1	4
Liberty	1	1	1	1	1	1	1	1	1	1	1	1	4
Madison	1	1	1	1	1	1	1	1	1	1	1	0	3
Manatee	1	1	1	1	1	1	1	0	0	1	0	0	2
Marion	1	1	1	1	1	1	1	1	0	1	1	1	3
Martin	1	1	1	1	1	1	1	1	1	1	1	1	4
Monroe	1	1	1	1	1	1	1	1	1	0	1	1	3
Nassau	1	1	1	1	1	1	1	1	1	1	1	1	4
Okaloosa	1	1	1	1	1	1	1	1	0	1	1	1	3
Okeechobee	1	1	1	1	1	1	1	1	0	1	1	1	3
Orange	1	1	1	1	1	1	1	1	1	1	1	1	4
Osceola	1	1	1	1	1	1	1	1	0	1	1	1	3
Palm Beach	1	1	1	1	1	1	1	1	1	1	1	1	4
Pasco	0	1	0	0	1	0	0	1	0	0	0	0	1
Pinellas	1	1	1	1	1	1	1	1	1	1	1	1	4
Polk	1	1	1	1	1	1	1	1	1	1	1	1	4
Putnam	1	1	1	1	1	1	0	1	1	0	1	1	3
Santa Rosa	1	1	1	1	1	1	1	1	1	1	1	1	4
Sarasota	0	1	1	0	1	0	0	1	0	0	0	0	2
Seminole	1	1	1	1	1	1	1	1	1	1	1	1	4
Saint Johns	1	1	1	1	1	1	1	1	1	1	1	1	4
Saint Lucie	1	1	1	1	1	1	1	1	1	1	1	1	4
Sumter	0	1	0	0	0	0	0	0	0	0	0	0	1
Suwannee	1	1	1	1	1	1	1	1	1	1	0	0	3
Taylor	1	1	1	1	1	1	1	1	1	1	1	1	4
Union	1	1	1	1	1	1	1	1	1	1	1	1	4
Volusia	1	1	1	1	1	1	1	1	0	1	1	1	3
Wakulla	0	1	0	1	1	0	0	0	0	0	0	0	1
Walton	1	1	0	0	1	0	0	1	0	0	0	0	2
Washington	1	1	1	1	1	1	1	1	0	1	1	1	3
Total	86.6%	95.5%	83.6%	89.6%	91.0%	80.6%	82.1%	85.1%	62.7%	77.6%	71.6%	59.7%	

Results of Logistic Regression

Multicollinearity Assumption

There was no multicollinearity among any of the independent variables included in the models. No independent variables had a correlation over 0.80. Also, multicollinearity was not detected during any of the analyses using the Variance Inflation Factor (VIF) test. A VIF score above 5.0 is considered to be the threshold for when collinearity between any two independent variables is large enough to affect the results of the analyses (Berman, 2002). The VIF scores for the independent variables in this study were less than 5.0. Therefore, multicollinearity was not evident. Additionally, the tolerance statistics exceeded 0.20 for all of the independent variables. A tolerance of less than 0.20 would indicate an issue with multicollinearity (O'Brien, 2007).

Results of Binary Logistic Regression for Cigarette Use

Table 6 shows the results of binary logistic regression for cigarette use with Level 1 factors and no policy-level factor. The Nagelkerke R-square value of the model was 21.8%, and the pseudo R-square suggested the model explains between 11.1% and 21.8% of the variation in youth cigarette use.

Table 6. Results of Binary Logistic Regression for Cigarette Use with Level 1 Factors

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio	
					Lower	Upper
Intercept		-2.671	.099			
Grade	9th					
10th		.033	.051	1.034	.935	1.143
11th		.238	.052	1.269*	1.147	1.404
12th		.522	.053	1.686*	1.518	1.872
Gender	Female					
Male		.230	.036	1.258*	1.172	1.350
Race/Ethnicity	White/Non-Hispanic					
Black /Non-Hispanic		-1.192	.065	.304*	.267	.345
Hispanic		-.383	.046	.682*	.623	.745
Other Race/Ethnicity		-.213	.062	.808*	.716	.913
Depressive symptoms	No					
Yes		.536	.039	1.710*	1.586	1.844
Anti-tobacco media exposure	No					
Yes		-.075	.042	.928	.854	1.007
Knowledge	No					
Yes		.079	.041	1.082	.999	1.173

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio	
					Lower	Upper
Behavioral belief – Die earlier	No					
Yes		-1.140	.050	.320*	.290	.353
Behavioral belief – More friends	No					
Yes		.387	.041	1.473*	1.359	1.597
Behavioral belief – Looks cool	No					
Yes		.556	.047	1.744*	1.592	1.911
Behavioral belief – Relieves stress	No					
Yes		1.149	.051	3.156*	2.854	3.489
Descriptive normative belief – Family	No					
Yes		.725	.036	2.066*	1.925	2.216
Descriptive normative belief – Peers	No					
Yes		.677	.041	1.968*	1.815	2.133
Not sure		.354	.061	1.425*	1.265	1.606
Control belief	No					
Yes		-.292	.064	.747*	.659	.847
Not sure		-.691	.078	.501*	.429	.584

Table 7 shows the results of multilevel binary logistic regression for cigarette use. The Nagelkerke R-square value of the model was 22.6%, and the pseudo R-square suggested the model explains between 11.5% and 22.6% of the variation in youth cigarette use. The demographic characteristics of grade, gender, and race/ethnicity were statistically significant predictors of youth cigarette use. Students in 11th grade (β=.251; OR=1.285) and students in 12th grade (β=.542; OR=1.719) were more likely to use cigarettes compared to students in 9th grade. The odds of cigarette use among males were 1.251 times the odds of cigarette use among females (β=.224). Compared to students who identified their race/ethnicity as White/Non-Hispanic, students who identified their race/ethnicity as Black/Non-Hispanic (β=-1.195; OR=.303), Hispanic (β=-.356; OR=.701), or other race/ethnicity (β=-.179; OR=.836) were less likely to use cigarettes.

Students who had depressive symptoms were more likely to use cigarettes than students who did not (β=.559; OR=1.750). Exposure to anti-tobacco media and knowledge were not statistically significant predictors of cigarette use.

All four behavioral beliefs were statistically significant predictors of youth cigarette use. Students who believed that smokers die earlier were less likely to use cigarettes (β=-1.108; OR=.330) than students who did not think they do. Students who believed that smokers have more friends (β=.443; OR=1.557), that smoking looks cool (β=.443; OR=1.805), or that smoking relieves stress (β=1.170; OR=3.222) were more likely to use cigarettes than those who did not have the same beliefs.

Normative beliefs were statistically significant predictors of youth cigarette use. Examination of students' descriptive normative beliefs related to family and peers showed that the likelihood of cigarette use among students with normative beliefs about behavioral performance by family members and peers was relatively higher than students without them. An individual who lived with a cigarette user was 2.027 times as likely to use cigarettes themselves as an individual who does not (β=.706). Students who had seen peers using cigarettes on school property (β=.499; OR=1.648) and students who were not sure whether they had seen peers using cigarettes on school property (β=.175; OR=1.191) were more likely to use cigarettes themselves than students who had not seen their peers using them.

The control belief related to a rule against smoking on school property was a statistically significant predictor of youth cigarette use. Students who thought there was a rule (β=-.317; OR=.728) and students who were not sure whether there was a rule (β=-.654; OR=.520) were less likely to use cigarettes compared to students who did not think there was such a rule.

The comprehensiveness level of a tobacco-free school policy was a statistically significant predictor of youth cigarette use. Students in school districts with no tobacco-free school policy (Level 0 in 2010) were more likely to smoke cigarettes than students in school

districts with Level 1 (β=-.714; OR=.490), Level 2 (β=-.384; OR=.681), Level 3 (β=-.499; OR=.607), or Level 4 (β=-.474; OR=.622).

Table 7. Results of Multilevel Binary Logistic Regression for Cigarette Use

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio Lower	Upper
Intercept		-2.393	.102			
Grade	9th					
10th		.040	.051	1.041	.943	1.150
11th		.251	.051	1.285*	1.162	1.421
12th		.542	.053	1.719*	1.549	1.907
Gender	Female					
Male		.224	.036	1.251*	1.165	1.343
Race/Ethnicity	White/Non-Hispanic					
Black /Non-Hispanic		-1.195	.065	.303*	.266	.344
Hispanic		-.356	.045	.701*	.642	.765
Other Race/Ethnicity		-.179	.062	.836*	.740	.944
Depressive symptoms	No					
Yes		.559	.039	1.750*	1.622	1.888
Anti-tobacco media exposure	No					
Yes		-.080	.042	.923	.849	1.003
Knowledge	No					
Yes		.049	.041	1.050	.968	1.138
Behavioral belief – Die earlier	No					
Yes		-1.108	.051	.330*	.299	.365
Behavioral belief – More friends	No					
Yes		.443	.041	1.557*	1.436	1.689
Behavioral belief – Looks cool	No					
Yes		.443	.041	1.805*	1.647	1.979
Behavioral belief – Relieves stress	No					
Yes		1.170	.052	3.222*	2.913	3.565
Descriptive normative belief - Family	No					
Yes		.706	.036	2.027*	1.889	2.174
Descriptive normative belief - Peers	No					
Yes		.499	.044	1.648*	1.513	1.795
Not sure		.175	.062	1.191*	1.054	1.345
Control belief	No					
Yes		-.317	.065	.728*	.641	.827
Not sure		-.654	.079	.520*	.445	.607
Tobacco-free school policy level	Level 0					
Level 1		-.714	.099	.490*	.403	.595
Level 2		-.384	.070	.681*	.595	.781
Level 3		-.499	.064	.607*	.535	.689
Level 4		-.474	.051	.622*	.563	.688

Results of Multinomial Logistic Regression for Cigarette Use

Table 8 shows the results of multinomial logistic regression for cigarette use with Level 1 factors and no policy-level factor. The Nagelkerke R-square value of the model was 20.8%, and

the pseudo R-square suggested the model explains between 11.9% and 20.8% of the variation in youth cigarette use

Table 8. Results of Multinomial Logistic Regression for Cigarette Use with Level 1 Factors

Less than Daily Cigarette Smoker

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio Lower	Upper
Intercept		-3.116	.109			
Grade	9th					
10th		.096	.056	1.101	.987	1.228
11th		.257	.057	1.293*	1.156	1.448
12th		.468	.061	1.597*	1.418	1.799
Gender	Female					
Male		.219	.040	1.245*	1.152	1.346
Race/Ethnicity	White/Non-Hispanic					
Black /Non-Hispanic		-1.168	.072	.311*	.270	.358
Hispanic		-.325	.051	.723*	.654	.798
Other Race/Ethnicity		-.230	.069	.795*	.694	.910
Depressive symptoms	No					
Yes		.503	.043	1.654*	1.521	1.798
Anti-tobacco media exposure	No					
Yes		-.013	.046	.987	.901	1.081
Knowledge	No					
Yes		.117	.044	1.124*	1.031	1.227
Behavioral belief – Die earlier	No					
Yes		-.968	.057	.380*	.339	.425
Behavioral belief – More friends	No					
Yes		.319	.047	1.375*	1.255	1.508
Behavioral belief – Looks cool	No					
Yes		.440	.053	1.553*	1.401	1.722
Behavioral belief – Relieves stress	No					
Yes		1.116	.057	3.052*	2.731	3.411
Descriptive normative belief - Family	No					
Yes		.596	.040	1.815*	1.677	1.963
Descriptive normative belief - Peers	No					
Yes		.670	.046	1.955*	1.788	2.137
Not sure		.314	.068	1.369*	1.198	1.566
Control belief	No					
Yes		-.171	.074	.843*	.729	.974
Not sure		-.563	.090	.570*	.477	.680

Daily Cigarette Smoker

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio Lower	Upper
Intercept		-3.826	.182			
Grade	9th					
10th		-.185	.096	.831	.689	1.003
11th		.182	.092	1.200*	1.003	1.436
12th		.686	.090	1.987*	1.665	2.370
Gender	Female					
Male		.262	.069	1.300*	1.136	1.487
Race/Ethnicity	White/Non-Hispanic					
Black /Non-Hispanic		-1.271	.126	.281*	.219	.359
Hispanic		-.578	.080	.561*	.479	.656
Other Race/Ethnicity		-.176	.109	.839	.677	1.039

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio Lower	Upper
Depressive symptoms	No					
Yes		.632	.068	1.881*	1.645	2.152
Anti-tobacco media exposure	No					
Yes		-.263	.077	.769*	.661	.894
Knowledge	No					
Yes		-.045	.075	.956	.825	1.107
Behavioral belief – Die earlier	No					
Yes		-1.564	.073	.209*	.182	.241
Behavioral belief – More friends	No					
Yes		.591	.066	1.805*	1.585	2.056
Behavioral belief – Looks cool	No					
Yes		.843	.075	2.324*	2.005	2.693
Behavioral belief – Relieves stress	No					
Yes		1.251	.105	3.493*	2.845	4.288
Descriptive normative belief - Family	No					
Yes		1.131	.064	3.100*	2.733	3.516
Descriptive normative belief - Peers	No					
Yes		.693	.079	2.000*	1.713	2.335
Not sure		.454	.111	1.574*	1.267	1.956
Control belief	No					
Yes		-.573	.094	.564*	.468	.678
Not sure		-.990	.130	.372*	.288	.479

Table 9 shows the results of multilevel multinomial logistic regression for cigarette use. The Nagelkerke R-square value of the model was 21.6%, and the pseudo R-square suggested the model explains between 12.3% and 21.6% of the variation in youth cigarette use. The demographic characteristics of grade, gender, and race/ethnicity were statistically significant predictors of youth cigarette use. Students in 11th grade (β=.269; OR=1.309) and students in 12th grade (β=.487; OR=1.627) were more likely to be less than daily cigarette smokers compared to students in 9th grade. Students in 11th grade (β=.198; OR=1.219) and students in 12th grade (β=.709; OR=2.033) were more likely to be daily smokers compared to students in 9th grade. The odds of less than daily cigarette use among males were 1.241 times the odds of less than daily cigarette use among females (β=.216). The odds of daily cigarette use among males were 1.283 times the odds of daily cigarette use among females (β=.249). Compared to students who identified their race/ethnicity as White/Non-Hispanic, students who identified their race/ethnicity as Black/Non-Hispanic (β=-1.171; OR=.310), Hispanic (β=-.302; OR=.739), or

other race/ethnicity (β=-.199; OR=.820) were less likely to be less than daily cigarette users. Students who identified their race/ethnicity as Black/Non-Hispanic (β=-1.274; OR=.280) or Hispanic (β=-.533; OR=.587) were less likely to be daily cigarette users.

Students who had depressive symptoms were more likely to be less than daily cigarette users (β=.526; OR=1.693) and daily cigarette users (β=.655; OR=1.926) than students who did not. Exposure to anti-tobacco media was not a statistically significant predictor of less than daily cigarette use. Students who had been exposed to anti-tobacco media were less likely to be daily cigarette users than students who had not (β=-.268; OR=.765). Students who had been taught about tobacco use in the past school year were more likely to be less than daily cigarette users (β=.088; OR=1.092). Knowledge was not a statistically significant predictor of daily cigarette use.

All four behavioral beliefs were statistically significant predictors of less than daily cigarette use. Students who believed that smokers die earlier were less likely to use cigarettes (β=-.936; OR=.392) than students who did not think they do. Students who believed that smokers have more friends (β=.372; OR=1.451), that smoking looks cool (β=.472; OR=1.604), and that smoking relieves stress (β=1.133; OR=3.106) were more likely to use cigarettes than those who did not have the same beliefs.

Similarly, all four behavioral beliefs were statistically significant predictors of daily cigarette use. Students who believed that smokers die earlier were less likely to use cigarettes (β=-1.533; OR=.216) than students who did not think they do. Students who believed that smokers have more friends (β=.652; OR=1.920), that smoking looks cool (β=.887; OR=2.428), and that smoking relieves stress (β=1.285; OR=3.614) were more likely to use cigarettes than those who did not have the same beliefs.

Normative beliefs were statistically significant predictors of youth cigarette use. An individual who lived with a cigarette user was 1.781 times as likely to use cigarettes less than daily (β=.577) and 3.042 times as likely to use cigarettes daily (β=1.113) as an individual who does not. Students who had seen peers using cigarettes on school property were more likely to use cigarettes less than daily (β=.498; OR=1.645) and more likely to use cigarettes daily (β=.502; OR=1.651) than students who had not seen their peers using them. Students who were not sure whether they had seen peers using cigarettes on school property were more likely to use cigarettes less than daily (β=.147; OR=1.159) and more likely to use cigarettes daily (β=.236; OR=1.266) than students who had not seen their peers using them.

The control belief related to a rule against smoking on school property was a statistically significant predictor of youth cigarette use. Students who thought there was a rule (β=-.198; OR=.820) and students who were not sure whether there was a rule (β=.532; OR=.588) were less likely to be less than daily cigarette users compared to students who did not think there was such a rule. Students who thought there was a rule (β=-.596; OR=.551) and students who were not sure whether there was a rule (β=-.938; OR=.391) were less likely to be daily cigarette users compared to students who did not think there was such a rule.

The comprehensiveness level of a tobacco-free school policy was a statistically significant predictor of youth cigarette use. Students in school districts with no tobacco-free school policy (Level 0 in 2010) were more likely to smoke cigarettes less than daily than students in school districts with Level 1 (β=-.710; OR=.491), Level 2 (β=-.380; OR=.684), Level 3 (β=-.450; OR=.638), and Level 4 (β=-.454; OR=.635). Students in school districts with no tobacco-free school policy (Level 0 in 2010) were more likely to smoke cigarettes daily than

students in school districts with Level 1 (β=-.740; OR=.477), Level 2 (β=-.403; OR=.668), Level 3 (β=-.651; OR=.521), or Level 4 (β=-.538; OR=.584).

Table 9. Results of Multilevel Multinomial Logistic Regression for Cigarette Use

Less than Daily Cigarette Smoker

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio Lower	Upper
Intercept		-2.845	.112			
Grade	9th					
10th		.103	.055	1.108	.994	1.236
11th		.269	.057	1.309*	1.170	1.464
12th		.487	.060	1.627*	1.446	1.831
Gender	Female					
Male		.216	.040	1.241*	1.148	1.342
Race/Ethnicity	White/Non-Hispanic					
Black /Non-Hispanic		-1.171	.072	.310*	.269	.357
Hispanic		-.302	.050	.739*	.670	.815
Other Race/Ethnicity		-.199	.069	.820*	.716	.938
Depressive symptoms	No					
Yes		.526	.043	1.693*	1.556	1.841
Anti-tobacco media exposure	No					
Yes		-.019	.047	.982	.896	1.076
Knowledge	No					
Yes		.088	.045	1.092*	1.000	1.192
Behavioral belief – Die earlier	No					
Yes		-.936	.057	.392*	.351	.439
Behavioral belief – More friends	No					
Yes		.372	.047	1.451*	1.323	1.592
Behavioral belief – Looks cool	No					
Yes		.472	.053	1.604*	1.446	1.778
Behavioral belief – Relieves stress	No					
Yes		1.133	.057	3.106*	2.778	3.473
Descriptive normative belief - Family	No					
Yes		.577	.040	1.781*	1.646	1.928
Descriptive normative belief - Peers	No					
Yes		.498	.049	1.645*	1.495	1.810
Not sure		.147	.070	1.159*	1.010	1.330
Control belief	No					
Yes		-.198	.075	.820*	.708	.950
Not sure		-.532	.091	.588*	.491	.703
Tobacco-free school policy level	Level 0					
Level 1		-.710	.105	.491*	.400	.604
Level 2		-.380	.076	.684*	.590	.793
Level 3		-.450	.073	.638*	.552	.736
Level 4		-.454	.054	.635*	.571	.707

Daily Cigarette Smoker

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio Lower	Upper
Intercept		-3.529	.184			
Grade	9th					
10th		-.175	.095	.840	.697	1.012
11th		.198	.092	1.219*	1.018	1.459
12th		.709	.090	2.033*	1.705	2.423

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio	
					Lower	Upper
Gender	Female					
Male		.249	.068	1.283*	1.122	1.467
Race/Ethnicity	White/Non-Hispanic					
Black /Non-Hispanic		-1.274	.126	.280*	.219	.358
Hispanic		-.533	.079	.587*	.502	.686
Other		-.135	.109	.874	.705	1.082
Depressive symptoms	No					
Yes		.655	.069	1.926*	1.683	2.205
Anti-tobacco media exposure	No					
Yes		-.268	.078	.765*	.657	.890
Knowledge	No					
Yes		-.079	.075	.924	.798	1.071
Behavioral belief – Die earlier	No					
Yes		-1.533	.073	.216*	.187	.249
Behavioral belief – More friends	No					
Yes		.652	.067	1.920*	1.682	2.192
Behavioral belief – Looks cool	No					
Yes		.887	.075	2.428*	2.096	2.813
Behavioral belief – Relieves stress	No					
Yes		1.285	.105	3.614*	2.940	4.443
Descriptive normative belief - Family	No					
Yes		1.113	.064	3.042*	2.682	3.451
Descriptive normative belief - Peers	No					
Yes		.502	.079	1.651*	1.413	1.930
Not sure		.236	.109	1.266*	1.022	1.569
Control belief	No					
Yes		-.596	.096	.551*	.456	.665
Not sure		-.938	.130	.391*	.303	.505
Tobacco-free school policy level	Level 0					
Level 1		-.740	.188	.477*	.330	.690
Level 2		-.403	.126	.668*	.522	.855
Level 3		-.651	.128	.521*	.406	.670
Level 4		-.538	.103	.584*	.477	.715

Results of Binary Logistic Regression for Cigar Use

Table 10 shows the results of binary logistic regression for cigar use with Level 1 factors and no policy-level factor. The Nagelkerke R-square value of the model was 16.4%, and the pseudo R-square suggested the model explains between 8.4% and 16.4% of the variation in youth cigar use.

Table 10. Results of Binary Logistic Regression for Cigar Use with Level 1 Factors

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio	
					Lower	Upper
Intercept		-3.076	.085			
Grade	9th					
10th		.037	.051	1.038	.939	1.147
11th		.299	.050	1.348*	1.224	1.486
12th		.519	.053	1.681*	1.514	1.866
Gender	Female					
Male		.533	.034	1.704*	1.593	1.823
Race/Ethnicity	White/Non-Hispanic					
Black /Non-Hispanic		-.154	.053	.857*	.773	.951
Hispanic		-.212	.043	.809*	.743	.881
Other Race/Ethnicity		-.020	.062	.980	.868	1.107
Depressive symptoms	No					
Yes		.405	.038	1.499*	1.391	1.616
Anti-tobacco media exposure	No					
Yes		.117	.042	1.124*	1.036	1.220
Knowledge	No					
Yes		.007	.040	1.007	.931	1.090
Behavioral belief – Die earlier	No					
Yes		-.925	.045	.397*	.363	.433
Behavioral belief – More friends	No					
Yes		.282	.040	1.325*	1.224	1.435
Behavioral belief – Looks cool	No					
Yes		.571	.047	1.770*	1.615	1.939
Behavioral belief – Relieves stress	No					
Yes		.940	.047	2.559*	2.333	2.807
Descriptive normative belief - Family	No					
Yes		.581	.035	1.789*	1.670	1.915
Descriptive normative belief - Peers	No					
Yes		.711	.040	2.036*	1.881	2.205
Not sure		.460	.061	1.584*	1.406	1.785
Control belief	No					
Yes		-.275	.061	.759*	.674	.856
Not sure		-.662	.074	.516*	.446	.596

Table 11 shows the results of multilevel binary logistic regression for cigar use. The Nagelkerke R-square value of the model was 17.0%, and the pseudo R-square suggested the model explains between 8.8% and 17.0% of the variation in youth cigar use. The demographic characteristics of grade, gender, and race/ethnicity were statistically significant predictors of youth cigar use. Students in 11th grade (β=.312; OR=1.366) and students in 12th grade (β=.538; OR=1.712) were more likely to use cigars compared to students in 9th grade. The odds of cigar use among males were 1.701 times the odds of cigar use among females (β=.531). Compared to

students who identified their race/ethnicity as White/Non-Hispanic, students who identified their race/ethnicity as Black/Non-Hispanic (β=-.145; OR=.865) or Hispanic (β=-.171; OR=.843) were less likely to use cigars.

Students who had depressive symptoms were more likely to use cigars (β=.423; OR=1.526) than students who did not. Students who had been exposed to anti-tobacco media were more likely to use cigars (β=.113; OR=1.120) than students that had not been exposed. Knowledge was not a statistically significant predictor of cigar use.

All four behavioral beliefs were statistically significant predictors of youth cigar use. Students who believed that smokers die earlier were less likely to use cigars (β=-.893; OR=.410) than students who did not think they do. Students who believed that smokers have more friends (β=.322; OR=1.380), that smoking looks cool (β=.600; OR=1.822), and that smoking relieves stress (β=.951; OR=2.587) were more likely to use cigars than those who did not have the same beliefs.

Normative beliefs were statistically significant predictors of youth cigar use. Examination of students' descriptive normative beliefs related to family and peers showed that the likelihood of cigar use among students with normative beliefs about behavioral performance by family members and peers was relatively higher than students without them. An individual who lived with a cigarette user was 1.760 times as likely to use cigars as an individual who did not (β=.565). Students who had seen peers using cigarettes on school property (β=.575; OR=1.777) and students who were not sure whether they had seen peers using cigarettes on school property (β=.323; OR=1.381) were more likely to use cigars than students who had not seen their peers using them.

The control belief related to a rule against smoking on school property was a statistically significant predictor of youth cigar use. Students who thought there was a rule (β=-.295; OR=.745) and students who were not sure whether there was a rule (β=-.627; OR=.534) were less likely to use cigars compared to students who did not think there was such a rule.

The comprehensiveness level of a tobacco-free school policy was a statistically significant predictor of youth cigar use. Students in school districts with no tobacco-free school policy (Level 0 in 2010) were more likely to smoke cigars than students in school districts with Level 1 (β=-.553; OR=.575), Level 2 (β=-.170; OR=.844), Level 3 (β=-.531; OR=.588), or Level 4 (β=-.354; OR=.702).

Table 11. Results of Multilevel Binary Logistic Regression for Cigar Use

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio	
					Lower	Upper
Intercept		-2.865	.087			
Grade	9th					
10th		.045	.050	1.046	.948	1.154
11th		.312	.049	1.366*	1.241	1.504
12th		.538	.053	1.712*	1.544	1.898
Gender	Female					
Male		.531	.035	1.701*	1.590	1.820
Race/Ethnicity	White/Non-Hispanic					
Black /Non-Hispanic		-.145	.053	.865*	.780	.961
Hispanic		-.171	.042	.843*	.775	.916
Other Race/Ethnicity		.008	.062	1.008	.893	1.137
Depressive symptoms	No					
Yes		.423	.038	1.526*	1.416	1.645
Anti-tobacco media exposure	No					
Yes		.113	.042	1.120*	1.031	1.216
Knowledge	No					
Yes		-.020	.040	.980	.906	1.060
Behavioral belief – Die earlier	No					
Yes		-.893	.045	.410*	.375	.448
Behavioral belief – More friends	No					
Yes		.322	.041	1.380*	1.274	1.494
Behavioral belief – Looks cool	No					
Yes		.600	.047	1.822*	1.664	1.996
Behavioral belief – Relieves stress	No					
Yes		.951	.047	2.587*	2.358	2.839
Descriptive normative belief - Family	No					
Yes		.565	.035	1.760*	1.643	1.884
Descriptive normative belief - Peers	No					
Yes		.575	.042	1.777*	1.637	1.929
Not sure		.323	.061	1.381*	1.225	1.556
Control belief	No					

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio	
					Lower	Upper
Yes		-.295	.061	.745*	.660	.840
Not sure		-.627	.073	.534*	.463	.617
Tobacco-free school policy level	Level 0					
Level 1		-.553	.084	.575*	.488	.678
Level 2		-.170	.075	.844*	.729	.977
Level 3		-.531	.070	.588*	.512	.675
Level 4		-.354	.050	.702*	.637	.774

Results of Multinomial Logistic Regression for Cigar Use

Table 12 shows the results of multinomial logistic regression for cigar use with Level 1 factors and no policy-level factor. The Nagelkerke R-square value of the model was 18.0%, and the pseudo R-square suggested the model explains between 10.0% and 18.0% of the variation in youth cigar use.

Table 12. Results of Multinomial Logistic Regression for Cigar Use with Level 1 Factors
Less than Daily Cigar Smoker

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio	
					Lower	Upper
Intercept		-3.351	.093			
Grade	9th					
10th		.119	.053	1.127*	1.015	1.251
11th		.364	.052	1.440*	1.300	1.594
12th		.550	.056	1.734*	1.555	1.933
Gender	Female					
Male		.497	.036	1.644*	1.533	1.763
Race/Ethnicity	White/Non-Hispanic					
Black /Non-Hispanic		-.201	.054	.818*	.735	.910
Hispanic		-.260	.045	.771*	.706	.842
Other Race/Ethnicity		-.113	.065	.893	.787	1.015
Depressive symptoms	No					
Yes		.370	.040	1.447*	1.338	1.565
Anti-tobacco media exposure	No					
Yes		.143	.043	1.154*	1.059	1.256
Knowledge	No					
Yes		.019	.042	1.019	.938	1.106
Behavioral belief – Die earlier	No					
Yes		-.777	.050	.460*	.417	.507
Behavioral belief – More friends	No					
Yes		.212	.043	1.236*	1.135	1.345
Behavioral belief – Looks cool	No					
Yes		.452	.050	1.572*	1.424	1.735
Behavioral belief – Relieves stress	No					
Yes		.942	.049	2.565*	2.332	2.821
Descriptive normative belief - Family	No					
Yes		.523	.036	1.687*	1.571	1.811
Descriptive normative belief - Peers	No					
Yes		.674	.042	1.963*	1.808	2.131

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio	
					Lower	Upper
Not sure		.359	.063	1.432*	1.265	1.621
Control belief	No					
Yes		-.124	.069	.884	.772	1.012
Not sure		-.537	.083	.585*	.497	.688

Daily Cigar Smoker

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio	
					Lower	Upper
Intercept		-5.232	.228			
Grade	9th					
10th		-.573	.140	.564*	.428	.743
11th		-.163	.131	.850	.657	1.099
12th		.345	.128	1.412*	1.099	1.814
Gender	Female					
Male		.852	.106	2.344*	1.905	2.884
Race/Ethnicity	White/Non-Hispanic					
Black /Non-Hispanic		.359	.136	1.431*	1.097	1.867
Hispanic		.247	.110	1.280*	1.032	1.589
Other Race/Ethnicity		.680	.154	1.973*	1.459	2.668
Depressive symptoms	No					
Yes		.629	.095	1.876*	1.556	2.261
Anti-tobacco media exposure	No					
Yes		-.069	.102	.934	.765	1.139
Knowledge	No					
Yes		-.026	.104	.975	.796	1.194
Behavioral belief – Die earlier	No					
Yes		-1.671	.098	.188*	.155	.228
Behavioral belief – More friends	No					
Yes		.816	.100	2.261*	1.860	2.748
Behavioral belief – Looks cool	No					
Yes		1.196	.100	3.308*	2.720	4.023
Behavioral belief – Relieves stress	No					
Yes		.823	.143	2.277*	1.719	3.016
Descriptive normative belief - Family	No					
Yes		1.018	.091	2.766*	2.313	3.308
Descriptive normative belief - Peers	No					
Yes		.994	.121	2.703*	2.132	3.428
Not sure		1.046	.150	2.847*	2.120	3.824
Control belief	No					
Yes		-1.000	.113	.368*	.294	.459
Not sure		-1.114	.155	.328*	.242	.445

Table 13 shows the results of multilevel multinomial logistic regression for cigar use. The Nagelkerke R-square value of the model was 18.7%, and the pseudo R-square suggested the model explains between 10.4% and 18.7% of the variation in youth cigar use. The demographic characteristics of grade, gender, and race/ethnicity were statistically significant predictors of youth cigar use. Students in 10th grade (β=.127; OR=1.135), students in 11th grade (β=.377;

OR=1.458), and students in 12th grade (β=.569; OR=1.766) were more likely to be less than daily cigar smokers compared to students in 9th grade. Students in 10th grade (β=-.569; OR=.566) were less likely to be daily cigar smokers compared to students in 9th grade. Students in 12th grade (β=.363; OR=1.438) were more likely to be daily cigar smokers compared to students in 9th grade. The odds of less than daily cigar use among males were 1.644 times the odds of less than daily cigar use among females (β=.497). The odds of daily cigar use among males were 2.329 times the odds of daily cigar use among females (β=.845). Compared to students who identified their race/ethnicity as White/Non-Hispanic, students who identified their race/ethnicity as Black/Non-Hispanic (β=-.193; OR=.824) or Hispanic (β=-.222; OR=.801) were less likely to be less than daily cigar users. Students who identified their race/ethnicity as Black/Non-Hispanic (β=.383; OR=1.467), Hispanic (β=.300; OR=1.350), or other race/ethnicity (β=.702; OR=2.017) were more likely to be daily cigar users.

Students who had depressive symptoms were more likely to be less than daily cigar users (β=.390; OR=1.477) and daily cigar users (β=.640; OR=1.896) than students who did not. Students who had been exposed to anti-tobacco media were more likely to be less than daily cigar users (β=.138; OR=1.148). Exposure to anti-tobacco media was not a statistically significant predictor of daily cigar use. Knowledge was not a statistically significant predictor of less than daily cigar smoking or daily cigar smoking.

All four behavioral beliefs were statistically significant predictors of less than daily cigar use. Students who believed that smokers die earlier were less likely to use cigars less than daily (β=-.744; OR=.475) than students who did not think they do. Students who believed that smokers have more friends (β=.245; OR=1.289), that smoking looks cool (β=.483; OR=1.620) and that

smoking relieves stress (β=.952; OR=2.592) were more likely to use cigars less than daily than those who did not have the same beliefs.

Similarly, all four behavioral beliefs were statistically significant predictors of daily cigar use. Students who believed that smokers die earlier were less likely to use cigars daily (β=-1.647; OR=.193) than students who did not think they do. Students who believed that smokers have more friends (β=.838; OR=2.312), that smoking looks cool (β=1.215; OR=3.372), and that smoking relieves stress (β=.830; OR=2.293) were more likely to use cigars daily than those who did not have the same beliefs.

Normative beliefs were statistically significant predictors of youth cigar use. An individual who lived with a cigarette user was 1.658 times as likely to use cigars less than daily (β=.506) and 2.746 times as likely to use cigars daily as an individual who did not (β=1.010). Students who had seen peers using cigarettes on school property (β=.530; OR=1.699) and students who were not sure whether they had seen peers using cigarettes on school property (β=.218; OR=1.244) were more likely to use cigars less than daily than students who had not seen their peers using them. Students who had seen peers using cigarettes on school property (β=.913; OR=2.491) and students who were not sure whether they had seen peers using cigarettes on school property (β=.956; OR=2.601) were more likely to use cigars daily than students who had not seen their peers using them.

The control belief related to a rule against smoking on school property was a statistically significant predictor of youth cigar use. Students who thought there was a rule (β=-.146; OR=.864) and students who were not sure whether there was a rule (β=-.504; OR=.604) were less likely to be less than daily cigar users compared to students who did not think there was such a rule. Students who thought there was a rule (β=-1.017; OR=.362) and students who were not

sure whether there was a rule (β=-1.084; OR=.338) were less likely to be daily cigar users compared to students who did not think there was such a rule.

The comprehensiveness level of a tobacco-free school policy was a statistically significant predictor of youth cigar use. Students in school districts with no tobacco-free school policy (Level 0 in 2010) were more likely to use cigars less than daily than students in school districts with Level 1 (β=-.545; OR=.580), Level 2 (β=-.214; OR=.807), Level 3 (β=-.528; OR=.590), or Level 4 (β=-.371; OR=.690). Students in school districts with no tobacco-free school policy (Level 0 in 2010) were more likely to use cigars daily than students in school districts with Level 1 (β=-.642; OR=.526) or Level 3 (β=-.509; OR=.601).

Table 13. Results of Multilevel Multinomial Logistic Regression for Cigar Use
Less than Daily Cigar Smoker

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio Lower	Upper
Intercept		-3.127	.093			
Grade	9th					
10th		.127	.052	1.135*	1.025	1.258
11th		.377	.052	1.458*	1.318	1.613
12th		.569	.055	1.766*	1.586	1.967
Gender	Female					
Male		.497	.036	1.644*	1.532	1.763
Race/Ethnicity	White/Non-Hispanic					
Black /Non-Hispanic		-.193	.055	.824*	.740	.918
Hispanic		-.222	.044	.801*	.734	.873
Other Race/Ethnicity		-.085	.065	.918	.809	1.042
Depressive symptoms	No					
Yes		.390	.040	1.477*	1.365	1.597
Anti-tobacco media exposure	No					
Yes		.138	.044	1.148*	1.054	1.251
Knowledge	No					
Yes		-.010	.042	.990	.912	1.075
Behavioral belief – Die earlier	No					
Yes		-.744	.050	.475*	.431	.525
Behavioral belief – More friends	No					
Yes		.254	.043	1.289*	1.184	1.404
Behavioral belief – Looks cool	No					
Yes		.483	.050	1.620*	1.468	1.788
Behavioral belief – Relieves stress	No					
Yes		.952	.049	2.592*	2.356	2.852
Descriptive normative belief - Family	No					
Yes		.506	.036	1.658*	1.544	1.780
Descriptive normative belief - Peers	No					
Yes		.530	.043	1.699*	1.561	1.850
Not sure		.218	.064	1.244*	1.098	1.410

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio Lower	Upper
Control belief	No					
Yes		-.146	.070	.864*	.754	.990
Not sure		-.504	.083	.604*	.514	.710
Tobacco-free school policy level	Level 0					
Level 1		-.545	.088	.580*	.488	.689
Level 2		-.214	.077	.807*	.694	.939
Level 3		-.528	.073	.590*	.511	.681
Level 4		-.371	.051	.690*	.624	.762

Daily Cigar Smoker

Variable	Baseline	Regression coefficient	Std. error	Odds ratio	95% C.I. for odds ratio Lower	Upper
Intercept		-5.109	.235			
Grade	9th					
10th		-.569	.140	.566*	.430	.745
11th		-.148	.130	.863	.668	1.114
12th		.363	.126	1.438*	1.123	1.842
Gender	Female					
Male		.845	.106	2.329*	1.894	2.864
Race/Ethnicity	White/Non-Hispanic					
Black /Non-Hispanic		.383	.136	1.467*	1.124	1.915
Hispanic		.300	.110	1.350*	1.088	1.674
Other Race/Ethnicity		.702	.153	2.017*	1.493	2.725
Depressive symptoms	No					
Yes		.640	.095	1.896*	1.573	2.285
Anti-tobacco media exposure	No					
Yes		-.065	.102	.937	.768	1.144
Knowledge	No					
Yes		-.049	.103	.952	.779	1.165
Behavioral belief – Die earlier	No					
Yes		-1.647	.097	.193*	.159	.233
Behavioral belief – More friends	No					
Yes		.838	.101	2.312*	1.898	2.817
Behavioral belief – Looks cool	No					
Yes		1.215	.100	3.372*	2.774	4.099
Behavioral belief – Relieves stress	No					
Yes		.830	.144	2.293*	1.731	3.038
Descriptive normative belief - Family	No					
Yes		1.010	.091	2.746*	2.296	3.285
Descriptive normative belief - Peers	No					
Yes		.913	.126	2.491*	1.945	3.191
Not sure		.956	.154	2.601*	1.924	3.516
Control belief	No					
Yes		-1.017	.114	.362*	.289	.452
Not sure		-1.084	.153	.338*	.251	.457
Tobacco-free school policy level	Level 0					
Level 1		-.642	.247	.526*	.324	.854
Level 2		.145	.173	1.156	.823	1.622
Level 3		-.509	-.172	.601*	.429	.843
Level 4		-.187	.119	.830	.657	1.048

Sensitivity Analysis

A sensitivity analysis was conducted to determine the robustness of the results with a smaller sample size. A random sample of 10% of the original dataset (n=7,146) was chosen through the IBM SPSS computer software to retest the models. Relative robustness of the findings was concluded.

In the binary logistic regression model for cigarette use, the independent variables of grade (11th), race/ethnicity (other race/ethnicity), the control belief that there was a rule against smoking at school (yes) were no longer statistically significant predictors of youth cigarette use. In the multinomial logistic regression model for cigarette use, the independent variables of gender, grade (11th and 12th), race/ethnicity (Hispanic and other race/ethnicity), knowledge, the control belief that there was a rule against smoking at school (yes), the descriptive normative belief related to peers (not sure), and the comprehensiveness of a tobacco-free school policy (Level 1 and Level 2) no longer were statistically significant predictors of less than daily cigarette use. The independent variables of gender, grade (11th and 12th), and exposure to anti-tobacco media were no longer statistically significant predictors of daily cigarette use.

In the binary logistic regression model for cigar use, the independent variables of grade (11th), race/ethnicity (Black/Non-Hispanic and Hispanic), the control belief that there was a rule against smoking at school (yes), and the comprehensiveness of a tobacco-free school policy (Level 2) no longer were statistically significant predictors of youth cigar use. In the multinomial logistic regression model for cigar use, the independent variables of grade (10th and 11th), race/ethnicity (Black/Non-Hispanic and Hispanic), the control belief that there was a rule against smoking at school (yes), and the comprehensiveness of a tobacco-free school policy (Level 2) no longer were statistically significant predictors of less than daily cigar use. The independent

variables of grade (12th), race/ethnicity (Black/Non-Hispanic, Hispanic, and other race/ethnicity), the descriptive normative belief related to peers (not sure), and the comprehensiveness level of a tobacco-free school policy (Level 3) no longer were statistically significant predictors of daily cigar use. The comprehensiveness level of a tobacco-free school policy (Level 2) became a statistically significant predictor of daily cigar use.

Conclusions of Hypothesis Testing

Background Factors

H1a. The male gender is positively associated with youth tobacco use among Florida high school students.

Hypothesis 1a was related to the background factor of gender. The baseline in the regression models was female. This variable was a statistically significant predictor in the models of binary cigarette use, multinomial cigarette use (less than daily smoker category), multinomial cigarette use (daily smoker category), binary cigar use, multinomial cigar use (less than daily smoker category), and multinomial cigar use (daily smoker category). Therefore, the researcher rejected the null hypothesis and concluded that being male is positively associated with youth tobacco use among Florida high school students.

H1b. Higher grade levels are positively associated with youth tobacco use among Florida high school students.

Hypothesis 1b was related to the background factor of grade level. In this study, the participants were divided into the 4 grade levels of 9th grade, 10th grade, 11th grade, and 12th grade. The baseline in the regression models was 9th grade. The 3 categories of this variable were statistically significant predictors in the multinomial model of cigar use (less than daily

smoker category). The order from the least impact to the greatest impact is consecutive as follows: 10th grade, 11th grade, and 12th grade. In the same multinomial model of cigar use (daily smoker category), the categories of 10th grade and 12th grade were statistically significant predictors. The two categories of 11th grade and 12th grade were statistically significant predictors of binary cigarette use, multinomial cigarette use (less than daily smoker category), multinomial cigarette use (daily smoker category), and binary cigar use. In these models, the category of 10th grade was statistically insignificant. In the multinomial model of cigar use (daily smoker category), students who were in 10th grade were less likely to be daily smokers than students who were in 9th grade. In all of the models except the multinomial model of cigar use (daily smoker category), the researcher rejected the null hypothesis and failed to reject the alternative hypothesis that higher grade levels are positively associated with youth tobacco use among Florida high school students. In the multinomial model of cigar use (daily smoker category), the researcher failed to reject the null hypothesis.

H1c. Identification as White/Non-Hispanic is positively associated with youth tobacco use among Florida high school students.

Hypothesis 1c was related to the background factor of race/ethnicity. The baseline in the regression models was White/Non-Hispanic. The other three categories were Black/Non-Hispanic, Hispanic, and other race/ethnicity. In the models of binary cigarette use, multinomial cigarette use (less than daily smoker category), multinomial cigarette use (daily smoker category), students who identified themselves as White/Non-Hispanic were the most likely to smoke cigarettes. In these models, the order of the other three race/ethnicity categories in order of greatest to least likelihood to smoke cigarettes is other race/ethnicity, Hispanic, and

Black/Non-Hispanic. However, the category of other race/ethnicity was not statistically significant in the model of multinomial cigarette use (daily smoker category). In the binary model of cigar use and the multinomial model of cigar use (less than daily smoker category), students who identified themselves as White/Non-Hispanic were the most likely to smoke cigars. In these models, students who identified themselves as Black/Non-Hispanic and Hispanic were less likely to smoke cigars, and the category of other race/ethnicity was not statistically significant. In the model of multinomial cigar use (daily smoker category), the order of the four race/ethnicity categories in order of greatest to least likelihood to smoke cigars daily is other race/ethnicity, Black/Non-Hispanic, Hispanic, and White/Non-Hispanic. In all of the models except for the model of multinomial cigar use (daily smoker category), the researcher rejected the null hypothesis and failed to reject the alternative hypothesis that race/ethnicity category of White/Non-Hispanic is positively associated with youth tobacco use among Florida high school students. In the multinomial model of cigar use (daily smoker category), the researcher failed to reject the null hypothesis.

H1d. Depressive symptoms are positively associated with youth tobacco use among Florida high school students.

Hypothesis 1d was related to the background factor of depressive symptoms. This variable was a statistically significant predictor of binary cigarette use, multinomial cigarette use (less than daily smoker category), multinomial cigarette use (daily smoker category), binary cigar use, multinomial cigar use (less than daily smoker category), and multinomial cigar use (daily smoker category). Therefore, the researcher rejected the null hypothesis and failed to

reject the alternative hypothesis that depressive symptoms are positively associated with youth tobacco use among Florida high school students.

H1e. Exposure to anti-tobacco media is negatively associated with youth tobacco use among Florida high school students.

Hypothesis 1e was related to the background factor of anti-tobacco media exposure. This variable was a statistically significant predictor of multinomial cigarette use (daily smoker category). Florida high school students who had been exposed to anti-tobacco media were less likely to be daily cigarette smokers. This variable was a statistically significant predictor of binary cigar use and multinomial cigar use (less than daily smoker category). Florida high school students who had been exposed to anti-tobacco media were more likely to be cigar smokers or less than daily cigar smokers. It was statistically insignificant for binary cigarette use, multinomial cigarette use (less than daily smoker category), and multinomial cigar use (daily smoker category). In the multinomial model of cigarette use (daily smoker category), the researcher rejected the null hypothesis and failed to reject the alternative hypothesis that exposure to anti-tobacco media is negatively associated with youth tobacco use among Florida high school students. In all of the other models, the researcher failed to reject the null hypothesis.

H1f. Knowledge about tobacco use is negatively associated with youth tobacco use among Florida high school students.

Hypothesis 1f was related to the background factor of knowledge. This variable, which represented whether a student had learned about tobacco in the past 12 months at school, was not a statistically significant predictor of binary cigarette use, multinomial cigarette use (daily

smoker category), binary cigar use, multinomial cigar use (less than daily smoker category), and multinomial cigar use (daily smoker category). It was a statistically significant predictor in the multinomial model of cigarette use (less than daily smoker category). Florida high school students that had learned about tobacco use during the school year were more likely to be less than daily cigarette smokers. In all of the models, the research failed to reject the null hypothesis.

Comprehensive Tobacco-Free School Policy

H2. A comprehensive tobacco free-school policy does reduce youth tobacco use among Florida high school students. The most comprehensive tobacco-free school policies will lead to greater reductions in the behaviors than the least comprehensive tobacco-free school policies.

Hypothesis 2 was related to the actual behavioral control of a comprehensive tobacco-free school policy. Another component of the reasoned action approach is actual behavioral control. The presence of an environmental constraint, such as a comprehensive tobacco-free school policy, might prevent students from acting on their behavior intentions to use tobacco and change his or her behavior of using tobacco. The actual behavioral control of a tobacco-free school policy is a statistically significant predictor of binary cigarette use, multinomial cigarette use, binary cigar use, and multinomial cigar use. All four levels of comprehensiveness of a tobacco-free school policy were statistically significant in these models except for the multinomial model of cigar use (daily smoker category) in which only Level 1 and Level 3 were statistically significant. Although tobacco-free school policies did reduce youth tobacco use among Florida high school students, the researcher failed to reject the null hypothesis. A comprehensive tobacco-free school policy with all 12 possible components did not necessarily lead to less tobacco use than one with fewer components. Tobacco-free school policies at the lowest comprehensiveness level were associated with the lowest likelihood of youth tobacco use.

Behavioral Beliefs

H3a. Behavioral beliefs that smokers die earlier are negatively associated with youth tobacco use among Florida high school students.

H3b. Behavioral beliefs that smokers have more friends are positively associated with youth tobacco use among Florida high school students.

H3c. Behavioral beliefs that smokers look cool are positively associated with youth tobacco use among Florida high school students.

H3d. Behavioral beliefs that smoking relieves stress are positively associated with youth tobacco use among Florida high school students.

Hypothesis 3a, Hypothesis 3b, Hypothesis 3c, and Hypothesis 3d were related to the behavioral beliefs about whether smokers die earlier, whether smokers have more friends, whether smoking looks cool, and whether smoking relieves stress. A behavioral belief is the first type of belief that is a component of the reasoned action approach. The beliefs about certain benefits or consequences as an outcome of a particular behavior, such as tobacco use, determine an individual's attitude towards it. An individual's attitude influences his or her behavior intention to use tobacco and his or her behaviors of using tobacco. The 2010 FYTS and 2014 FYTS asked about four behavioral beliefs – whether smokers die earlier, whether smokers have more friends, whether smoking looks cool, and whether smoking relieves stress. All four of these behavioral beliefs were statistically significant predictors of binary cigarette use, multinomial cigarette use, binary cigar use, and multinomial cigar use. Therefore, the researcher rejected the null hypothesis and failed to reject the alternative hypothesis that the behavioral belief that smokers die earlier is negatively associated with youth tobacco use among Florida high school students. Also, the research rejected the null hypotheses and failed to reject the alternative

hypotheses that the behavioral beliefs that smokers have more friends, smoking looks cool, and smoking relieves stress are positively associated with youth tobacco use among Florida high school students.

Normative Beliefs

H4a. Descriptive normative beliefs that a student's family members use tobacco themselves are positively associated with youth tobacco use among Florida high school students.

H4b. Descriptive normative beliefs that a student's peers use tobacco themselves are positively associated with youth tobacco use among Florida high school students.

Hypothesis 4a and Hypothesis 4b were related to descriptive normative beliefs about family members and peers. A normative belief is the second type of belief that is a component of the reasoned action approach. The beliefs about whether the important people in one's life, such as family members and peers, approve of a particular behavior or perform a particular behavior (e.g., tobacco use), leads to an individual's perceived norm of it. This, in turn, influences an individual's behavior intention to use tobacco and his or her behavior of using tobacco. The 2010 FYTS and 2014 FYTS asked about two descriptive normative beliefs – whether a student lives with a family member that smokes and whether a student has seen his or her peers smoking at school.

Descriptive normative beliefs that a student's family members or peers use tobacco were statistically significant predictors of binary cigarette use, multinomial cigarette use, binary cigar use, and multinomial cigar use. Therefore, the researcher rejected the null hypotheses and failed to reject the alternative hypotheses that the descriptive normative beliefs that a student's family members and a student's peers use tobacco themselves are positively associated with youth tobacco use among Florida high school students.

Control Beliefs

H5. Control beliefs that a tobacco-free school policy has been implemented are negatively associated with youth tobacco use among Florida high school students.

Hypothesis 5 was related to a control belief. A control belief is the third type of belief that is a component of the reasoned action approach. Control beliefs about an inhibiting factor, such as a tobacco-free school policy, lessens an individual's perceived behavioral control over tobacco use. This affects the individual's behavior intention to use tobacco and his or her behavior of using tobacco. The 2010 FYTS and 2014 FYTS asked a question about whether there is an established rule against smoking at school, which represented a control belief. A control belief was a statistically significant predictor of binary cigarette use, multinomial cigarette use, binary cigar use, and multinomial cigar use. Therefore, the researcher rejected the null hypothesis and failed to reject the alternative hypothesis that the control belief that a tobacco-free school policy has been implemented is negatively associated with youth tobacco use among Florida high school students.

CHAPTER 6. DISCUSSION

Introduction to Discussion

This study examined the impact of the recently implemented smoking cessation policies, as well as individual-level factors and interpersonal-level factors, on youth cigarette smoking and cigar smoking in Florida public schools. The findings of this study have both theoretical implications and practical implications. This study concludes with an explanation of identified limitations and recommendations for future research.

Summary of Hypothesis Testing

A summary of hypothesis testing for cigarette use is provided in Table 14, and a summary of hypothesis testing for cigar use is provided in Table 15. These tables indicate whether a hypothesis was supported or not supported in each logistic regression model. An X in the corresponding box indicates a supported hypothesis in a particular model. A hyphen in the corresponding box indicates a hypothesis that was not supported in a particular model.

Model 1 is the binary logistic regression model for cigarette use. Model 2a is the multinomial logistic regression model for cigarette use (less than daily smoker category), and Model 2b is the multinomial logistic regression model for cigarette use (daily smoker category). Model 3 is the binary model for cigar use. Model 4a is the multinomial logistic regression model for cigar use (less than daily smoker category), and Model 4b is the multinomial logistic regression model for cigar use (daily smoker category).

Table 14. Summary of Hypothesis Testing for Cigarette Use

Hypothesis	**Model**		
	1	2a	2b
Hypothesis 1a: The male gender is positively associated with youth tobacco use among Florida high school students.	X	X	X
Hypothesis 1b: Higher grade levels are positively associated with youth tobacco use among Florida high school students.	X	X	X

Hypothesis	Model		
	1	2a	2b
Hypothesis 1c: Identification as White/Non-Hispanic is positively associated with youth tobacco use among Florida high school students.	X	X	X
Hypothesis 1d: Depressive symptoms are positively associated with youth tobacco use among Florida high school students.	X	X	X
Hypothesis 1e: Exposure to anti-tobacco media is negatively associated with youth tobacco use among Florida high school students.	-	-	X
Hypothesis 1f: Knowledge about tobacco use is negatively associated with youth tobacco use among Florida high school students.	-	-	-
Hypothesis 2: A comprehensive tobacco free-school policy does reduce youth tobacco use among Florida high school students.	X	X	X
The most comprehensive tobacco-free school policies will lead to greater reductions in the behaviors than the least comprehensive tobacco-free school policies.	-	-	-
Hypothesis 3a: Behavioral beliefs that smokers die earlier are negatively associated with youth tobacco use among Florida high school students.	X	X	X
Hypothesis 3b: Behavioral beliefs that smokers have more friends are positively associated with youth tobacco use among Florida high school students	X	X	X
Hypothesis 3c: Behavioral beliefs that smokers look cool are positively associated with youth tobacco use among Florida high school students.	X	X	X
Hypothesis 3d: Behavioral beliefs that smoking relieves stress are positively associated with youth tobacco use among Florida high school students.	X	X	X
Hypothesis 4a: Descriptive normative beliefs that a student's family members use tobacco themselves are positively associated with youth tobacco use among Florida high school students.	X	X	X
Hypothesis 4b: Descriptive normative beliefs that a student's peers use tobacco themselves are positively associated with youth tobacco use among Florida high school students.	X	X	X
Hypothesis 5: Control beliefs that a tobacco-free school policy has been implemented are negatively associated with youth tobacco use among Florida high school students.	X	X	X

Table 15. Summary of Hypothesis Testing for Cigar Use

Hypothesis	Model		
	3	4a	4b
Hypothesis 1a: The male gender is positively associated with youth tobacco use among Florida high school students.	X	X	X
Hypothesis 1b: Higher grade levels are positively associated with youth tobacco use among Florida high school students.	X	X	-
Hypothesis 1c: Identification as White/Non-Hispanic is positively associated with youth tobacco use among Florida high school students.	X	X	-
Hypothesis 1d: Depressive symptoms are positively associated with youth tobacco use among Florida high school students.	X	X	X

Hypothesis	**Model**		
	3	4a	4b
Hypothesis 1e: Exposure to anti-tobacco media is negatively associated with youth tobacco use among Florida high school students.	-	-	-
Hypothesis 1f: Knowledge about tobacco use is negatively associated with youth tobacco use among Florida high school students.	-	-	-
Hypothesis 2: A comprehensive tobacco free-school policy does reduce youth tobacco use among Florida high school students.	X	X	X
The most comprehensive tobacco-free school policies will lead to greater reductions in the behaviors than the least comprehensive tobacco-free school policies.	-	-	-
Hypothesis 3a: Behavioral beliefs that smokers die earlier are negatively associated with youth tobacco use among Florida high school students.	X	X	X
Hypothesis 3b: Behavioral beliefs that smokers have more friends are positively associated with youth tobacco use among Florida high school students	X	X	X
Hypothesis 3c: Behavioral beliefs that smokers look cool are positively associated with youth tobacco use among Florida high school students.	X	X	X
Hypothesis 3d: Behavioral beliefs that smoking relieves stress are positively associated with youth tobacco use among Florida high school students.	X	X	X
Hypothesis 4a: Descriptive normative beliefs that a student's family members use tobacco themselves are positively associated with youth tobacco use among Florida high school students.	X	X	X
Hypothesis 4b: Descriptive normative beliefs that a student's peers use tobacco themselves are positively associated with youth tobacco use among Florida high school students.	X	X	X
Hypothesis 5: Control beliefs that a tobacco-free school policy has been implemented are negatively associated with youth tobacco use among Florida high school students.	X	X	X

Background Factors and Youth Tobacco Use

The 2012 U.S. Surgeon General's report outlined particular demographic characteristics and background factors that are associated with a higher likelihood of youth tobacco use (CDC, 2012). The literature suggests that demographic characteristics do have an impact on a person using tobacco products. Consistent with previous research, the findings of this study show that males are more likely than females to smoke cigarettes and smoke cigars (SAMHSA, 2013).

Previous research also shows that students in higher grade levels in school (SAMHSA, 2013) and students who identify as White/Non-Hispanic (Kann et al., 2014; SAMHSA, 2013) are

more likely to use tobacco, but the findings of this study do not completely align. In the model of multinomial cigar use, students who were in 9th grade and students who identified as other race/ethnicity were the most likely to smoke cigars every day.

Three background factors in addition to demographic characteristics that are discussed in the 2012 U.S. Surgeon General's report are affective processes, anti-tobacco media exposure, and participation in school-based informational approaches. Negative affective processes, such as depressive symptoms (Acierno et al., 2000; Dierker et al., 2001; Kim et al., 2009; Martini et al., 2002; Patton et al., 1998), have been associated with a higher likelihood to smoke cigarettes. In this study, students who had experienced depressive symptoms were more likely to use tobacco products, so the findings are consistent with previous research on the relationship between affective processes and youth tobacco use. Infrequent exposure to anti-tobacco messages has also been associated with a higher likelihood to use tobacco products (Bauer et al., 2000; Niederdeppe et al., 2004; Sly, Heald, & Ray, 2001; Sly, Hopkins, Trapido, & Ray, 2001; Sly et al., 2002). Exposure to anti-tobacco media was only associated with a lower likelihood of daily cigarette use among Florida high school students. Contrary to the hypotheses for the binary logistic regression model for cigar use and the multinomial logistic regression model for cigar use, exposure to anti-tobacco media was associated with a higher likelihood of being a cigar smoker or a less than daily cigar smoker. School-based informational approaches to reducing tobacco use are not usually effective (CDC, 2012; U.S. DHHS, 1994). Informational approaches focus on the harmful consequences of smoking. As explained by Goodstadt (1978), many programs might effectively change knowledge, which is important in itself, but such change might not be enough to alter behavior. While learning about tobacco use in school was not associated with youth tobacco use in most of the models in this study, Florida high school

students that had learned about tobacco use during the current school year were more likely to be less than daily smokers. This finding shows that improved knowledge about tobacco use is not necessarily associated with less tobacco use.

Comprehensive Tobacco-Free School Policies and Youth Tobacco Use

Most school districts across the country had some type of policy or regulation related to tobacco smoking by the late 1980s (CDC, 1989). The enactment of the federal Pro-Children Act of 1994 encouraged the majority of schools to create additional policies related to tobacco. The results of studies that have examined the impacts of tobacco-free school policies have been mixed. Previous literature has suggested that the presence of a policy alone does not significantly reduce the prevalence of youth tobacco use (Adams et al., 2009; Griesbach et al., 2002; Murnaghan et al., 2007; Wakefield et al., 2000). Policies with all four levels of comprehensiveness were associated with lower likelihoods of cigarette smoking, less than daily cigarette smoking, daily cigarette smoking, cigar smoking, and less than daily cigar smoking. Policies at Level 1 and Level 3 were associated with lower likelihoods of daily cigar smoking. As previously stated, the findings of this study show that a comprehensive tobacco-free school policy with all 12 possible components does not necessarily reduce youth tobacco use more than a policy with fewer components.

Although this finding is inconsistent with the hypothesis, it highlights the fact that particular components of a tobacco-free school policy might be effective in reducing youth tobacco use, while the comprehensiveness alone is not as important in reaching this objective. The CDC (2012) identified students' perceived enforcement of their school's smoking policy as an important factor in reducing the risk of smoking (CDC, 2012). When students believed that the tobacco-free school policies were enforced, they were less likely to smoke (Lovato, Sabiston,

Hadd, Nykiforuk, & Campbell, 2007; Murnaghan, Leatherdale, Sihvonen, & Kekki, 2008). However, this study only examined the impacts of the four levels of comprehensiveness of a tobacco-free school policy. It did not examine the impact of individual components.

Behavioral Beliefs and Youth Tobacco Use

The findings of this study are evidence of the role that cognitive processes play in youth tobacco use. An example of the "conscious, explicit, and planned" cognitive process is an expectation of a positive or negative outcome of smoking (CDC, 2012, p. 447). The findings indicated that a student who held positive behavioral beliefs about youth tobacco use (i.e., more friends, looks cool, relieves stress) was more likely to smoke cigarettes or cigars. On the other hand, a student who held negative behavioral beliefs about youth tobacco use (i.e., die earlier) was less likely to smoke cigarettes or cigars. Other studies have found that "belief in the negative health consequences of smoking" was a protective factor against youth tobacco use (CDC, 2012, p. 448; Myers, McCarthy, MacPherson, & Brown, 2003; Rodriguez, Romer, & Audrain-McGovern, 2007). The findings of this study also show that belief in positive outcomes of smoking was a risk factor of youth tobacco use.

Normative Beliefs and Youth Tobacco Use

The two types of small social groups that play the most important roles "in the development of young people and their use of tobacco" are family groups and peer groups (CDC, 2012, p. 439). Normative influences related to these small social groups are associated with increased youth tobacco use among high school students. In the literature, adolescents' own smoking behavior have been associated with their perceptions of friends' smoking behaviors, as well as their friends' actual smoking behaviors (Alesci et al., 2003; Ali & Dwyer, 2009; Conrad et al., 1992; Jackson, 1997; Kim et al., 2009; Kobus, 2003; McVicar, 2011; Tyas & Pederson,

1998; U.S. DHHS, 1994; Villanti et al., 2011). In discussions of peer influence of adolescent smoking behavior, social learning is an often suggested mechanism of influence (Bandura, 1977; CDC, 2012; Petraitis, Flay, & Miller, 1995). Adolescents learn about tobacco through their observations of peers using tobacco, and the use of tobacco is reinforced through the perception of apparent advantages, such as "gaining acceptance by peers or establishing a particular social identity" (CDC, 2012, p. 439). Parental smoking and sibling smoking were strongly associated with smoking among youth in a meta-analysis conducted by Leonardi-Bee, Jere, and Britton (2011). Despite whether their parents use tobacco themselves, teenagers are less likely to start using tobacco products if their parents strongly disapprove of their tobacco use. Such parental disapproval, which is a negative injunctive normative belief related to a student's parents, has been found to counteract peer influence to use tobacco (CDC, 2012). However, this variable could not be incorporated into this study.

Control Beliefs and Youth Tobacco Use

Control beliefs about an inhibiting factor, such as a tobacco-free school policy, lessen an individual's perceived behavioral control over tobacco use. This affects the individual's behavior intention to use tobacco and his or her behavior of using tobacco. Students who thought there was a rule against smoking on school property and students who were not sure about such a rule were less likely to smoke cigarettes or cigars.

The results from all four models in this study indicate that students who did not think there was a rule against smoking on school property were the most likely to smoke cigarettes or cigars, while students who were not sure whether there was such a rule were the least likely to use these tobacco products. These findings are consistent with the suggestion by Murnaghan et al. (2008) that the awareness of tobacco policies and programs at their school varies among

students who are regular smokers, occasional smokers, or nonsmokers. When attending a school with both smoking programs and policies, the risk of occasional smoking decreased among students who believed that there were clear school rules against smoking at a school. However, in the same setting, students who did not believe that there were clear school rules against smoking were at a substantially increased risk of occasional smoking (Murnaghan et al., 2008).

Contributions

Theoretical Contributions

This study was guided by a theoretical framework based on the reasoned action approach, which is a social psychological theory, and the social ecological model. This theoretical framework enabled the researcher to study the youth behavior of tobacco use in social and educational environments and to further understand which individual-level factors, interpersonal-level factors, and policy-level factors are associated with youth tobacco use. This study examined the predictors of a high school student's decision to use tobacco based on the constructs found in the reasoned action approach at the various levels of influence in the social ecological model. It did not solely focus on only the environmental, biological, or behavioral determinants of youth tobacco use alone. Instead, the multilevel nature of tobacco control efforts among youth was recognized.

Actual behavioral control in the reasoned action approach is located at the policy level of the social ecological model. Prior to the development of the reasoned action approach, the theory of reasoned action was created and then extended into the theory of planned behavior. These two theories have guided the examination of youth tobacco use behaviors in previous studies, but the reasoned action approach has not been similarly applied. This study incorporated the theoretical construct of an actual behavioral control as a factor found at the policy level. The

comprehensiveness level of a tobacco-free school policy was the variable representing this theoretical construct in the reasoned action approach. Tobacco-free school policies had an impact on youth tobacco use. However, the most comprehensive policies did not necessarily lead to greater reductions in youth tobacco use than the less comprehensive policies. The findings support the importance of this construct in the reasoned action approach and the policy level of the social ecological model when applied to this topic.

The background factors in the reasoned action approach are found at the individual level of the social ecological model. According to the report on the 2012 National Survey on Drug Use and Health (SAMHSA, 2013), males are more likely to use tobacco use than females. According to the report on the 2012 National Survey on Drug Use and Health (SAMHSA, 2013), older students are more likely to use tobacco than younger students. According to the report on the 2012 National Survey on Drug Use and Health (SAMHSA, 2013) and the report by Kann et al. (2014), individuals who identify themselves as White/Non-Hispanic are more likely to use cigarettes and cigars. Many studies have reported the association between depression and tobacco use (Acierno et al., 2000; Dierker et al., 2001; Kim et al., 2009; Martini et al., 2002; Patton et al., 1998). Studies on anti-tobacco media campaigns have concluded that less exposure is associated with more tobacco use (Bauer et al., 2000; Niederdeppe et al., 2004; Sly, Heald, & Ray, 2001; Sly, Hopkins, Trapido, & Ray, 2001; Sly et al., 2002). According to the 1994 U.S DHHS report and the 2012 CDC report, research has concluded that school-based informational approaches to reducing tobacco use are usually not effective. This study found that the background factors of demographic characteristics, depressive symptoms, anti-tobacco media exposure, and knowledge have an impact on youth tobacco use. The findings support the

importance of these constructs in the reasoned action approach and the individual level of the social ecological model when applied to this topic.

The behavioral beliefs and control beliefs in the reasoned action approach are found at the individual level of the social ecological model. This study found that both behavioral beliefs and control beliefs have an impact on youth tobacco use. These findings support the importance of these constructs in the reasoned action approach and the individual level of the social ecological model when applied to youth tobacco use.

The normative beliefs in the reasoned action approach are situated at the interpersonal level of the social ecological model. Parental smoking has been linked to the behavior among young people (CDC, 2012). Many studies have examined the impact of normative beliefs related to peers on youth tobacco use (Alesci et al., 2003; Ali & Dwyer, 2009; Conrad et al., 1992; Jackson, 1997; Kim et al., 2009; Kobus, 2003; McVicar, 2011; Tyas & Pederson, 1998; U.S. DHHS, 1994; Villanti et al., 2011). This study found that descriptive normative beliefs related to family members and peers have an impact on youth tobacco use. The findings support the importance of this construct in the reasoned action approach and the interpersonal level of the social ecological model when applied to this topic. However, injunctive normative beliefs related to family members could not be tested in this study.

Theoretical framework graphs were developed to illustrate the supported hypotheses in this study. Figure 5 shows the supported hypotheses in the multinomial logistic regression model for cigarette use, and Figure 6 shows the supported hypotheses in the multinomial logistic regression model for cigar use. The top arrows represent the less than daily smoker category, while the bottom arrows represent the daily smoker category. The supported hypotheses for each

model are listed above the corresponding arrows in the figures. The unsupported hypotheses were omitted from the figures.

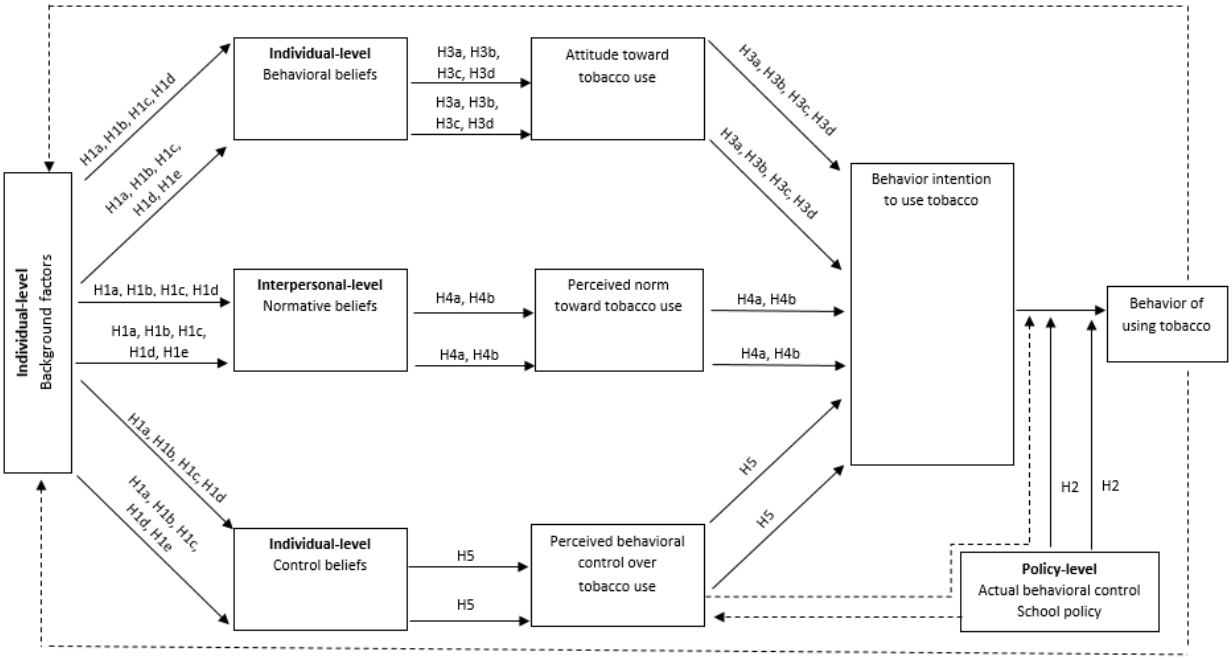

Figure 5. Supported Hypotheses in the Multinomial Logistic Regression Model for Cigarette Use

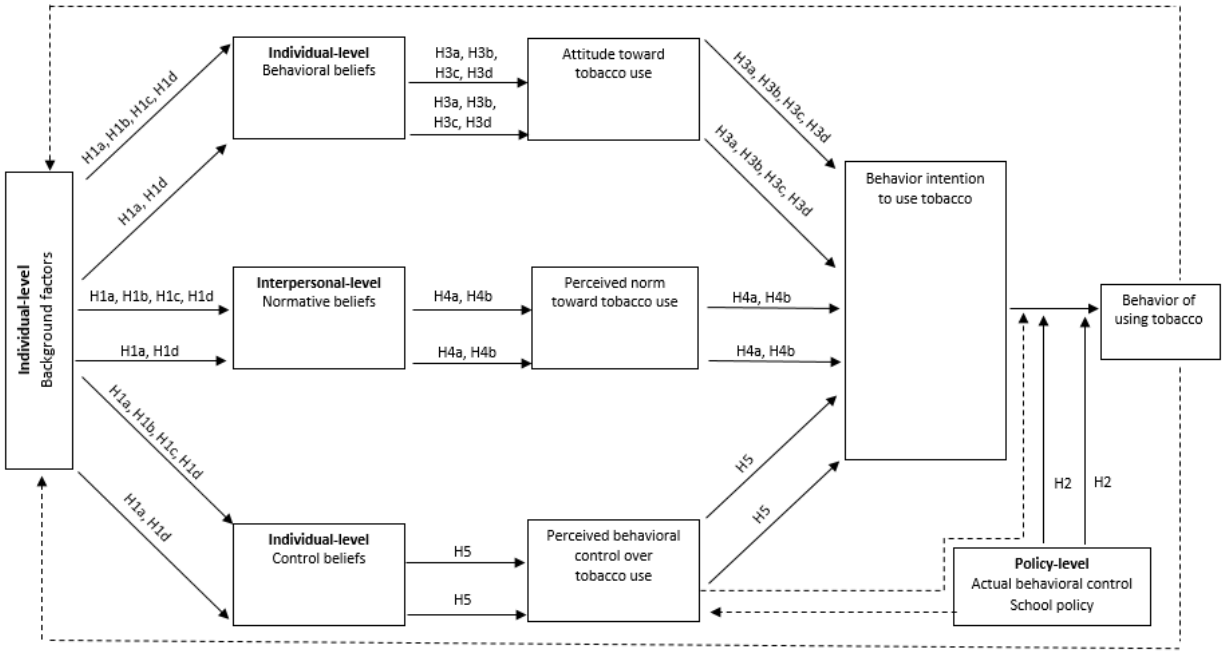

Figure 6. Supported Hypotheses in the Multinomial Logistic Regression Model for Cigar Use

Practical Contributions

Once the individual-level factors, interpersonal-level factors, and policy-level factors that contribute to youth tobacco use were recognized, preventative and therapeutic programs and interventions can be suggested and improved. This study conferred more evidence-based knowledge for improving public policies and interventional strategies towards smoking prevention and cessation for youth. As previously discussed, the CDC reported that some studies have suggested that proximal social influences, which are those related to an individual, his or her peers, and his or her parents, are particularly predictive of tobacco use among young people. These seem to have an influence that is "stronger, more direct, and more immediate than macro-level factors," such as the school climate and community norms (CDC, 2012, p. 459). However, these macro-level factors are also strong predictors of youth tobacco use because they are unavoidable in society, and they have a powerful effect on the proximal social influences (CDC, 2012).

This study contributes to the literature regarding the impact of tobacco-free school policies on youth tobacco use among Florida high school students, as well as helps public school districts in Florida understand which policies are most effective in reducing youth tobacco use. Existing studies have provided evidence that the presence of a tobacco-free school policy alone does not significantly reduce the prevalence of youth tobacco use (Adams et al., 2009; Griesbach et al., 2002; Murnaghan et al., 2007; Wakefield et al., 2000). Furthermore, consistent enforcement of tobacco-free school policies has been considered essential in efforts to lower youth smoking rates (CDC, 2012). According to Adams et al. (2009) and Hahn et al. (2005), although a tobacco-free school policy is comprehensive, it might not fulfill its objective of deterring youth tobacco use if it is missing an enforcement component. In the Bureau of Tobacco

Free Florida's list of 12 possible components in a public school district's tobacco-free school policy, two of the components relate to enforcement. The 11th component outlines an enforcement plan for students, staff, and visitors. The 12th component outlines an enforcement plan for students and staff that provides cessation resources. Including an enforcement component that provides cessation resources in a tobacco-free school policy is important in efforts to reduce the prevalence of youth smoking (Terry & Zhang, 2016).

Wakefield et al. (2000) discovered that school smoking bans only lowered youth smoking rates when they were strongly enforced. It is important to note that the impact of any comprehensiveness level of tobacco-free school policies could have been moderated by the overall decrease in youth tobacco use between 2010 and 2014. No tobacco-free school policies were implemented in 2010 because the amendment to the Florida Clean Indoor Air Act was not passed until June 2011.

In regard to the background factor of knowledge, the findings of this study align with similar results indicating the ineffectiveness of learning-based approaches to reduce tobacco use. On the other hand, the findings align with similar results indicating the effectiveness of anti-tobacco media campaigns. The relative importance of behavioral beliefs, descriptive normative beliefs related to a student's family members and peers, and control beliefs is crucial in policy development. The behavioral belief that smoking relieves stress was a consistently strong predictor of youth tobacco use. Although many school-based interventions emphasize how to resist social pressures, there are few programs which teach students how to manage and reduce stress through alternative coping strategies (Scales, Monahan, Rhodes, Roskos-Ewoldsen, & Johnson-Turbes, 2009). Based on consistently documented evidence that students are more likely to smoke if they have family members and peers who smoke, social influences should continue

to be a priority in tobacco control efforts focused on reducing youth smoking (Alexander, Piazza, Mekos, & Valente, 2001; Aloise-Young, Graham, & Hansen, 1994; Avenevoli & Merikangas, 2003; Duncan, Tildesley, Duncan, & Hops, 1995; Kobus, 2003; Sabiston et al., 2009; Urberg, Degirmencioglu, & Pilgrim, 1997). Tobacco control efforts should also be directed at both students' perceptions of smoking rates and reducing the visibility of student smokers at school (Evans-Whipp, Bond, Toumbourou, & Catalano, 2007; Leatherdale & Manske 2005; Otten, Engels, & Prinstein, 2009; Reid et al., 2008; Sabiston et al., 2009).

Based on the results of this study, there are five policy recommendations to further reduce youth tobacco use. Three recommendations for public school districts in the Florida are (1) to increase students' understanding of the consequences, (2) to inform students about stress management and reduction techniques, and (3) to develop students' skills to resist social and environmental pressures. Two recommendations for both public school districts and the state of Florida are (4) to implement strict control and enforcement measures and (5) to provide cessation resources for students and staff.

Study Limitations

The FYTS was designed as a cross-sectional survey which involves different students as participants each year. Associations between the dependent variable and independent variables can be identified, but causality among the variables cannot be inferred.

The self-reporting of data might lead to social desirability bias in the results. Individuals tend to respond to survey questions in a socially acceptable direction. In other words, students might have falsely reported whether they smoke cigarettes or cigars. The prevalence of youth tobacco use based on the FYTS results would be lower than the actual prevalence of youth tobacco use if this behavior occurred.

Data were collected only from students who attended schools in the public school districts of Florida. The results might not be generalizable to all high school-aged youth who are home schooled, attend private schools, or live in other states or countries.

The tobacco market is becoming increasingly diverse, and notable changes in youth and adult tobacco use behaviors have been documented in recent years. The patterns of youth tobacco use changed during the study period between 2010 and 2014. The prevalence of cigarette use, as well as cigar use to some extent, generally declined among youth in Florida and the United States, while the use of hookah and electronic cigarettes increased. More recent trends, while important, may not reflect the context of the time period associated with the analysis. Therefore, it is difficult to determine how much of the decrease is realistically attributable to the policy-level factor of a comprehensive tobacco-free school policy.

It was not possible to include injunctive normative beliefs about a student's family into the regression models in this study due to the available answer choices on the FYTS. Injunctive normative beliefs about a student's family are important because teenagers are less likely to start using tobacco products if their parents strongly disapprove of their tobacco use despite the normative influences of parents and peers (CDC, 2012).

Smokeless tobacco, hookah, and electronic cigarettes were not included as dependent variables because they did not fit into this study due to the constructs of behavioral beliefs and normative beliefs in the theoretical framework. The 2010 FYTS asked relevant questions only about beliefs related to smoking. However, the 2014 FYTS was revised to include these questions related to smokeless tobacco. According to the 1994 U.S. Surgeon General's report, an individual's beliefs related to the health consequences and social effects of smokeless tobacco

might differ considerably from his or her beliefs about smoking cigarettes or cigars (U.S. DHHS, 1994).

Future Recommendations

A future study should be conducted to replicate this study using the 2016 FYTS dataset. This will further the understanding of the long-term policy impacts of tobacco-free school policies in Florida public school districts because it will be five years since the amendment to the Florida Clean Indoor Air Act was passed by Governor Rick Scott in June 2011.

The inclusion of injunctive normative beliefs related to a student's family would require a revised measurement instrument. A question about injunctive normative beliefs related to a student's family should ask whether a student's parents would approve or disapprove of his or her tobacco use, but the answer choices should not indicate whether the respondent is a smoker or nonsmoker. Adding smokeless tobacco, hookah, and electronic cigarettes as dependent variables would require the omission of behavioral beliefs and normative beliefs as independent variables in the logistic regression models unless a future study is only guided by the social ecological model and does not incorporate the reasoned action approach.

Conclusions

Although some limitations existed, the conclusions that have been drawn as a result of this study have contributed to the field of literature on tobacco-free school policies. In addition, this study examined youth tobacco use based on the social ecological model and enabled the researcher to conclude that a variety of individual-level, interpersonal-level, and policy-level factors play an important role in smoking behavior among high school students.

The results of this study led to a better understanding of which policies, environments, and cognitions contribute to preventing and reducing teenage tobacco use, which is imperative in

controlling the risks related to smoking and improving youth health. Once the individual-level factors, interpersonal-level factors, and policy-level factors that contribute to youth tobacco use were recognized, preventative and therapeutic programs and interventions can be suggested and improved. This study conferred more evidence-based knowledge for improving public policies and interventional strategies towards smoking prevention and cessation for youth.

APPENDIX: IRB APPROVAL LETTER

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901, 407-882-2012 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

From : **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To : **Amanda S. Terry**

Date : **April 24, 2015**

Dear Researcher:

On 04/24/2015 the IRB determined that the following proposed activity is not human research as defined by DHHS regulations at 45 CFR 46 or FDA regulations at 21 CFR 50/56:

Type of Review:	Not Human Research Determination
Project Title:	Tobacco Prevention and Cessation Policies and Youth Tobacco Use in Florida Public Schools
Investigator:	Amanda S. Terry
IRB ID:	SBE-15-11204
Funding Agency:	
Grant Title:	
Research ID:	N/A

University of Central Florida IRB review and approval is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are to be made and there are questions about whether these activities are research involving human subjects, please contact the IRB office to discuss the proposed changes.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Kanille Chap

IRB Coordinator

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